1794
XLIII

FLIGHT

and The AIRCRAFT ENGINEER

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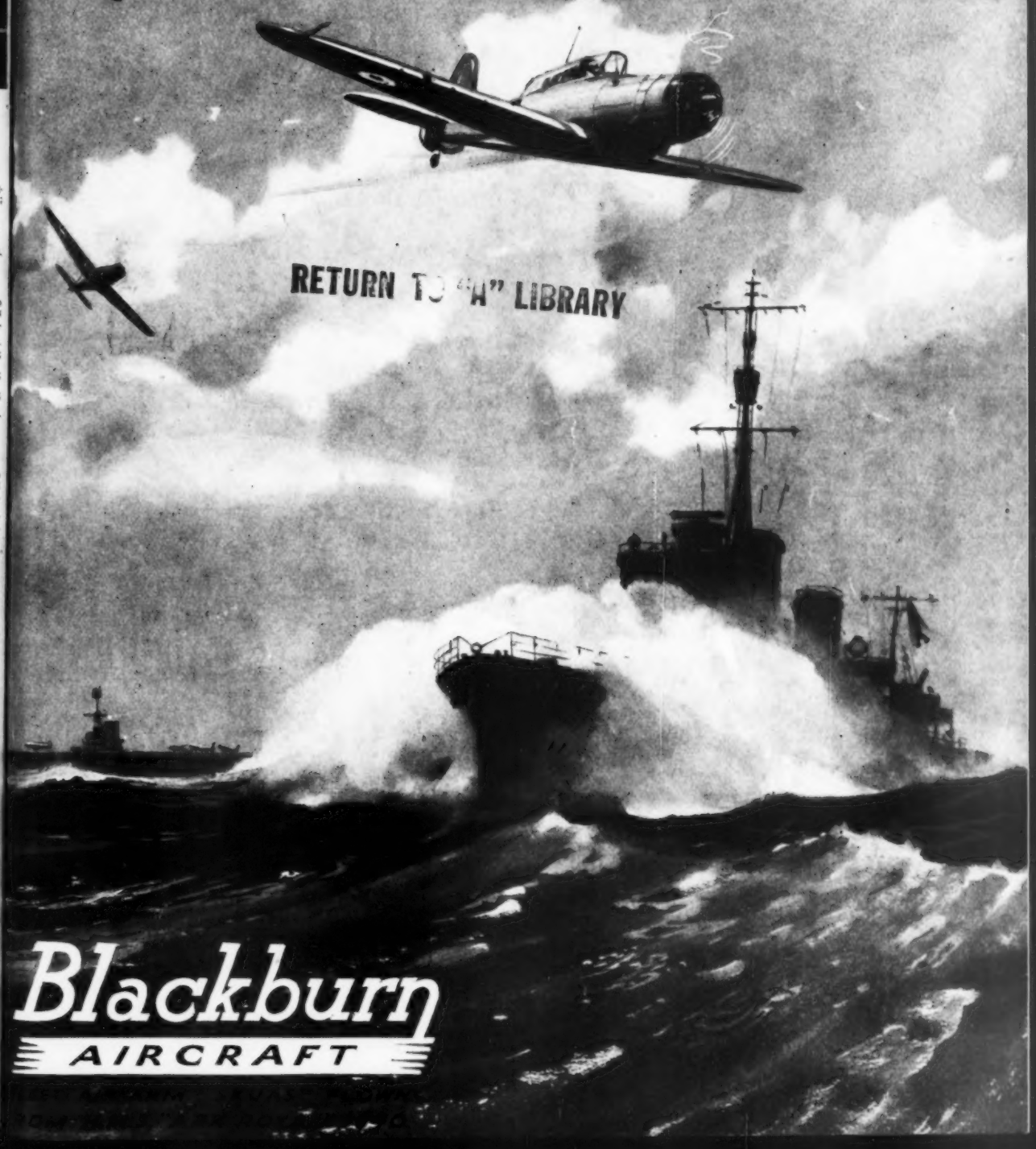
OFFICIAL ORGAN OF THE ROYAL AERO CLUB

MAY 13th, 1943



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FLIGHT and The AIRCRAFT ENGINEER

FIRST AERONAUTICAL WEEKLY IN THE WORLD : FOUNDED 1909

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The Outlook

Bomber Casualties

ON April 20th Bomber Command lost 31 machines in its triple attack on Stettin, Rostock and Berlin. On April 28th it lost 23 machines, and in the raid on Dortmund on the night of May 4th the losses were 30 bombers. The prompt publication of these figures by the Air Ministry is apt to have a disturbing effect on the public and to produce a certain amount of depression. They provoke no fear that the war is not going well, nor any doubts about ultimate victory, but they do cause grief at the thought of gallant lives lost and magnificent machines destroyed. That is only natural.

At the same time the British public rejoices wholeheartedly every time the Eighth Army or the First Army attacks and gains ground. It is often stated in general terms that "casualties have been heavy on both sides," and anyone who stops to think must know that hundreds of British soldiers have been killed and wounded that day; but because no figure of losses has been published the British citizen goes home full of delight at the victory. A couple of tanks destroyed may mean more homes bereaved than when a bomber is shot down, but the effect on the spirits of the public is quite different. By the standards of the Army or the Navy the loss of 30 bombers is quite a trivial incident of war; but because of the different ways of announcing the losses the public looks on the two from utterly different standpoints.

It is an old saying among soldiers that you cannot make an omelet without breaking eggs, and an A.O.C. who sends out aircraft expecting a certain percentage of losses is no more callous about human life than the General who orders an infantry brigade to assault a mountain.

Actually, the percentage of losses in recent bombing raids has been growing steadily smaller. If ten machines were despatched and two lost, the percentage would be very high, but the public would hardly be depressed. The loss of 30 out of a very large force may well represent a much lower percentage. In other words, the air crew which now starts off on a raid has a very much better chance of coming safely home than it would have had a year ago. Another way of looking at it is to reflect that in no other way could such heavy damage be done to places like Essen and Dortmund at such small cost as by air bombing. Also, each German munition factory destroyed may well mean saving the lives of British soldiers when the Army invades the Continent.

We grieve for the lost airmen, but we should not lose our sense of proportion.

Victory in Tunisia

THE rapid capture of Tunis and Bizerta came as a welcome surprise. Everybody had expected a resolute attack by the Allies, and knew that it would be delivered from the West rather than by the Eighth Army on the South. But warnings had been issued of the difficulties ahead, and especially of the strength of the fortress of Bizerta. The masterly dispositions of General Alexander, and the magnificent fighting by the First Army, the Americans and the French swept everything before them, and decisive victory had come almost before the public in Britain knew that it was certainly on the way.

One factor undoubtedly helped General Alexander, and full acknowledgment was made of it in the communiqué issued last Thursday. That communiqué spoke of "complete air domination," and went on to say that the Allied Air Forces made "the most concentrated air

attack of the war" and "blasted a path in advance of our ground units." Such superlative terms have never before been used in any headquarters communiqué from either side in either the last war or in this. During the Somme battles in 1916 the British held undoubted air mastery until the coming of Boelcke on the scene, and in the early stages of the present war the Germans profited much from their ascendancy in the air—but no terms resembling those just quoted have ever been read before in a sober official report.

Aircraft Versatility

IT is significant that the report in question was issued before the Allies had made their rapid dash on to the two important cities of Tunisia. It alluded to the first break-through when the fighting was still in the mountains. It is a general rule that in mountain warfare neither bombers nor artillery can produce their best results. This time the rule seems hardly to have held good. The aircraft were evidently used as field artillery to hammer the lines of the enemy, and it is equally evident that they did so to great effect. It helped enormously that the enemy could put up no air opposition of any account, and bombers and fighter-bombers could concentrate on making good shooting with no thought of hostile air interference to distract them.

Once the Allied infantry and armour broke through to the plains, everything became simpler. The bombs from the air became more effective, for near misses could be nearly as destructive as direct hits (which is rarely the case when the target is in the hills), while the armour could spread out and use its speed and fire power to the best advantage. The aircraft then transformed themselves from field artillery into pursuing cavalry, and smashed up long columns on the lines of the enemy's retreat. The phenomenal speed of the Allies' dash from the mountains across the plains to Bizerta and Tunis must go to the credit of the armour, the armoured cars, and the motorised infantry, for in no other way could such distances have been covered in the time.

In these two stages of assault and pursuit the Air Forces proved their versatility. But there was an earlier example of that versatility which should not be forgotten. This was the attack on sea and air communications in the Sicilian Straits before General Alexander struck. Evidence is already to hand that it left the Axis short of various essentials for effective resistance.

In the last three weeks of April the Axis lost no fewer than 193 transport aircraft, with a capacity of carrying 636 tons of material or 6,000 fully armed soldiers. In addition to this there were heavy sinkings of ships, in which the R.A.F. was assisted by submarines, light naval forces, and the Albacores of the Fleet Air Arm, all of which did magnificent work. It goes without saying that a ship can carry more than a transport aircraft can do, and the loss of tankers and cargo ships was, therefore, a more grievous loss to von Arnim.

The enemy's greatest shortage was in aircraft, despite the great concentration of fighters which he had made in Tunisia and Sicily. Large numbers had been destroyed by Allied bombing of airfields. A commander who is conspicuously short of any one essential arm can hardly hope for victory, whether that arm be aircraft, guns, tanks, or infantry. One report, made after the Allied victory was certain, concluded that von Arnim had actually sent the remnants of his Air Forces away, and that was why the Allies met with no resistance in the air. If that be true, it was a policy of despair, implying that the German General knew that the game was up and that he had decided to save all that could be saved. The only arm which could be evacuated easily was the air arm, while the ground units were left to make what resistance they could with a hostile sea behind them and a hostile sky overhead.

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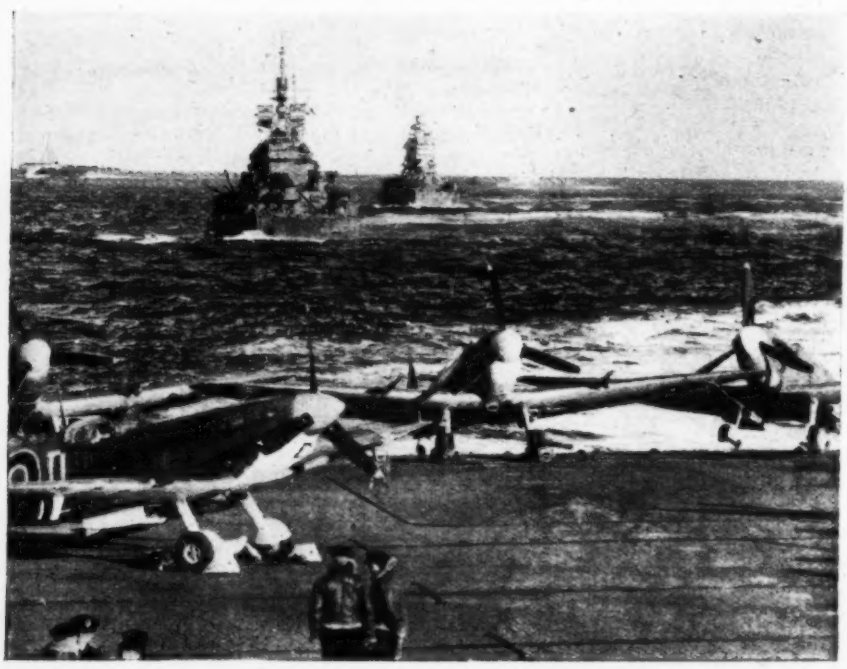


NAVAL AIR PROTECTION: Vickers Supermarine Seafires ranged on the deck of one of our aircraft carriers. The problems of air cover for a fleet at sea are discussed in the article Sea Fighter Air Cover, on pages 507-508 in this issue.

WAR in the AIR

250-YARD FULL-LOAD TAKE-OFF: Just over a year ago 16 U.S. Mitchells bombed Tokio. Only recently was the information released that these took off from the deck of the American carrier *Hornet*. No mention is made of any take-off assistance other than the usual 30-knot air flow over the flight deck.

Ominous Japanese Moves : Russian Air Strength : The Luftwaffe Stretched : Allied Offensive in Tunisia

THE Japanese seem to be planning mischief, not an unusual thing for them to do. They have lately assembled a fleet of submarines somewhere near the coasts of Australia, and they have laid down a chain of airfields in the semi-circle of occupied islands which is said to be capable of accommodating 1,500 aircraft. Recently they marked their aggressive mood by sending a fairly strong force of bombers with fighter escort to raid Darwin. A Spitfire squadron went up to meet them and tackled them with good effect. In the fight three of the British pilots were shot down, but the enemy suffered more heavily, and presently the Japanese turned tail and went off. The Spitfires followed *ventre à terre* (to use an utterly inappropriate but most graphic phrase) and so keen were they on the hunt that they did not watch their petrol gauges with sufficient care. The wind turned against them, and when they tried to get home a number of them ran out of fuel and came down in the sea. Fortunately all the pilots were picked up, but a number of valuable Spitfires were lost—a matter for great regret.

No doubt the Japanese are keeping a watchful eye on the war in Europe, and news from Tunisia may well give them the hint that the anti-Comintern sun will not be shining for very long, and that they had better make hay as fast as they can. Still, Japanese conceit is so great that they may well misread the writing on the Tunisian and Russian walls. Gen. MacArthur's Air Force is kept busy hitting at the Japanese in all directions, and it has suffered small losses itself. Consequently, the new aircraft which are continually reaching him from America are additions rather than replacements.

Over in the States Col. Knox, Secretary for the Navy, has spoken about the War of the Atlantic. There have been more attacks on U-boats, which, he said, were due to better air covering and more escort vessels. He did not attempt to express an opinion as to which form of escort was the more valuable. Both are evidently essential, and of late it has been noticed that most of the sinkings have taken place on that stretch of the Atlantic which was beyond the working range of aircraft from either shore.

Another American authority, Mr. Angus Macdonald, has rather damped the pleasure aroused by Col. Knox's remarks by stating that the Germans are now producing faster and stronger U-boats. Bomber Command is making things as difficult as possible for the builders of U-boats as well as for those who service them at Lorient and St. Nazaire, but the Germans seem to be progressing none the less. We are told that scientists have produced new devices which help the escort vessels, and now the aircraft carry depth charges in place of bombs, which makes their attacks more deadly, but it is still a stiff fight for the mastery.

It is very comforting to know that now the Russians outnumber the *Luftwaffe* in the number of aircraft on the Eastern Front, but the Germans have better communications behind their lines and can probably mass their squadrons so as to gain superiority for a time at a particular point. Something less than half the whole *Luftwaffe* is now stationed in Russia, but it could hardly be called a well-balanced Air Force there. The German bombers heavily outnumber the fighters; in fact something like 66 per cent. of the whole German bomber force is calculated to be massed against the Russians, whereas the fighter cover pro-

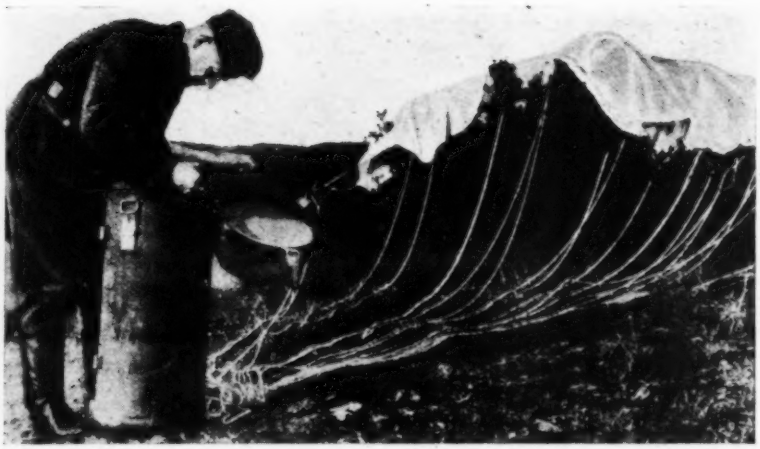
WAR IN THE AIR

vided is only about one quarter of the fighter strength of the *Luftwaffe*. That is due to the pressure exerted by the R.A.F. in the west and by the Allies in N.W. Africa, whose exertions are thus of very real assistance to our Russian Allies. On the other hand, the recent raids undertaken by the Russians on Königsberg may lead to increased defences being allotted to that city, which in turn would help Bomber Command and still further stretch the German resources.

The Bomber Offensive

THE recent attack by Bomber Command on Dortmund must have come as a surprise to that town, as it had not before been the object of a first-class night raid. The force which attacked it was composed of the greatest number of four-engined bombers which had ever set out against a single objective. Thirty bombers were lost, but the proportion of losses to the total raiding force was on the low side. Some of the pilots who returned said that they had not encountered many night fighters, and it was also stated that the *flak* was not unduly heavy; from which one must conclude that many of the attacks by the night fighters were successful, and that the bombers which were attacked did not, in many cases, return. Some of the crews, of course, may be prisoners of war.

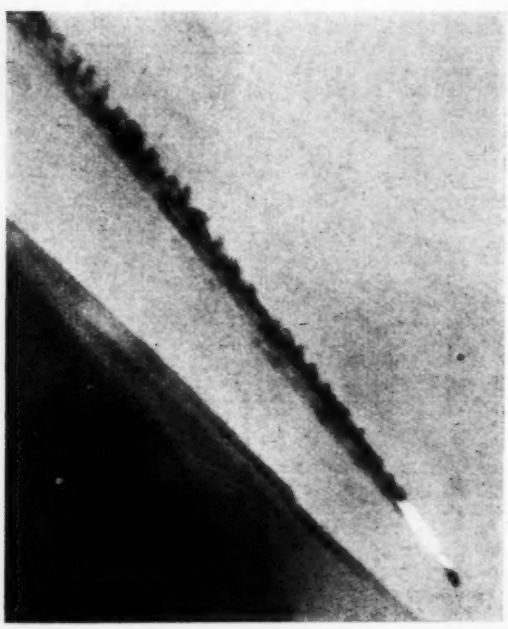
The damage done to that important Ruhr town is believed to have been serious. Incidentally, the R.A.F. night raid followed a daylight raid by the Americans on the military targets in Antwerp, some 120 miles away from Dortmund. Many American air crews must now be training for night work, and when they are ready we may confidently expect that the U.S. 8th Air Force will add its weight to that of the R.A.F. by making deep raids into Germany by night.



LEASE-LEND ? According to German sources this is one of the parachute supply containers dropped by the Royal Air Force to re-arm Yugoslav guerillas.

The growing strength of the night fighter force which Germany is now using for protection of her cities is significant. As the summer advances there will be more clear nights, and the latest theory is that a clear night helps the defence rather than the attack. The Germans are keeping something like 60 per cent. of their fighter force (including both single-engined and twin-engined types) in the West, and so are leaving their large bomber force in Russia somewhat short of protection. What is more, they are tending to divert production from bombers to fighters, which means a definitely defensive strategy, and that is all to the good.

They have, however, a bomber force of no contemptible size held somewhere in the West for the purpose of opposing the Allied invasion which they know is coming. This force could be used for a somewhat heavy raid on Britain, and it was probably responsible for the recent attack on a town in the north of Scotland. The enemy is obviously anxious not to incur heavy losses, and chose a place where he expected to effect a surprise and not to meet with heavy opposition. Actually R.A.F. night fighters did go up to meet the raiders. It may also be noticed that of late the tip-and-run raids on south coast towns have ceased to be daily affairs. The Typhoons and other fighters were making them rather expensive, and in any case they did not help Hitler to win the war. But British strategy is now definitely offensive, and we do not intend to allow the German terror raids to achieve their obvious object of tying down a disproportionate amount of our energies to defence. There may be more German raids on British cities; we know that our people can "take it," and the sooner we can batter the Axis into unconditional surrender the sooner the whole horrible business will be brought to an end.



INTO THE STORMY BAY : A Ju 88 falling in flames into the Bay of Biscay after being shot down by a long-range Beaufighter.

Tunisia

THINGS are moving so fast in Tunisia that what is written one day may well seem ancient history on the morrow. This, however, can be said at the moment, that when General Alexander sent forward the First Army and the Americans and French to the north of it in a determined attack early on the morning of Thursday, May 6th, the Air Forces gave "magnificent support." The term "complete air domination" was used in the first official communiqué from H.Q. in North Africa. It is seldom that such air supremacy is attained in modern war, but the combined air strength of the Allies on that theatre is probably about double that of the Axis. The R.A.F. alone outnumbers the *Luftwaffe* and *Regia Aeronautica* together in the Mediterranean. When we say R.A.F., we include Dominion and certain Allied squadrons which have been all along working under the orders of Air Chief Marshal Tedder. The Americans bring up the Allied total to overwhelming strength. Consequently the ground troops fought their way forward with-

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ENEMY AIR LOSSES TO MAY 8th

	Over G.B.	Continent	Middle East	N.W. Africa
May 2	0	8	5	3
" 3	0	5	0	0
" 4	0	6	0	1
" 5	0	0	0	11
" 6	0	0	1	23
" 7	3	1	1	4
" 8	2	0	0	17
	5	20	7	59

Totals: West, 6,846; Middle East, over 5,309; North West Africa, 1,678.

FAR EAST FIGHTERS: A row of U.S. Navy and Marine Wildcats lined up by a palm-fringed runway on Guadalcanal Island.

out any interference from the air, while the Strategic Air Force (again the official words are worth quoting) "deprived the enemy of desperately needed supplies."

The air arm did more than that. When the big Allied attack started a week ago, the aircraft "blasted a path in advance of our ground units." French, Americans and British troops stormed forward in an irresistible rush. The mountains were left behind, and the Allied armour fanned out on the plains. Completely dominating the air, the British and American air squadrons never ceased to unload their bombs on the bewildered enemy, returned to load up again, and set forth once more to carry on the work of destruction. The speed of the advance utterly upset such plans as von Arnim had made for defence, and the British were in Tunis and the Americans in Bizerta before the British public had realised that either of them had reached the outskirts of those two towns. The Axis forces were cut into segments, and in the first four days of the onset over 50,000 prisoners had been taken. When complete air supremacy has been won much becomes possible, and even easy, which before had seemed a desperate step.

By last Sunday no enemy aircraft were to be seen in the skies, and it seems that von Arnim ordered his squadrons, shattered as they were, to evacuate the country while the going was still good, and retreat to Sicily.

Some surprise has been expressed that the final blow should be struck by the First Army and the Americans, leaving the famous Eighth Army in a more or less passive role on the Enfidaville line. Some of the First Army soldiers were heard to remark chaffingly that the "Desert Rats" would find themselves somewhat at a loss in the mountains. That is not the true explanation. The Eighth Army tied down a strong enemy force by local activities, patrols, feint attacks, and so on. But obviously General Alexander was right to strike at the flank of the Axis position, instead of trying to roll it up from the South. Even so, the Eighth Army detached the 7th Armoured Division and the 4th Indian Division, and sent them round by a circuitous route to reinforce the First Army. Many Indian regiments (Punjabis and Gurkhas) are highly trained in hill warfare. The 7th Armoured Division had the satisfaction of receiving the surrender of what remained of its old opponents, the 15th Panzer Division, including the Divisional General and his staff.

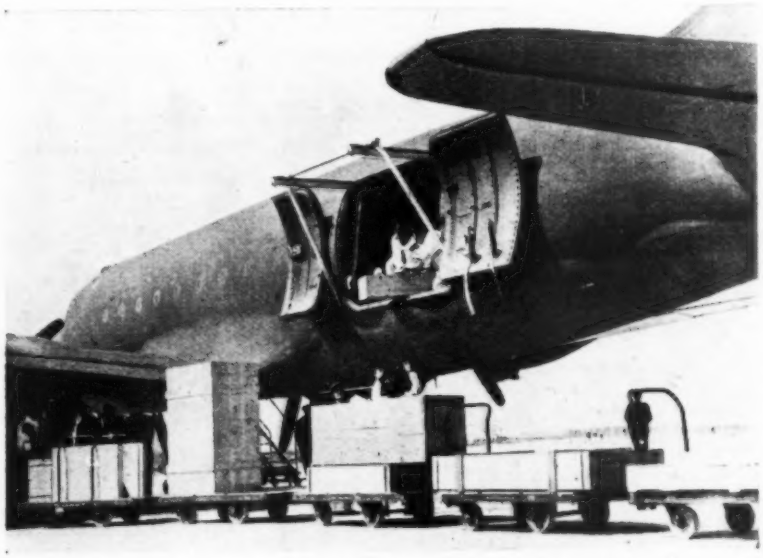
This campaign will be a classic which will be studied in all its ups and downs for years to come at Camberley and every other staff college in the world—not least at the R.A.F. Staff College at Andover. During the course of it the Allies have learnt how to weld three nations of Allies into one fighting force, how to employ the three forces of sea, land and air, in mutual support and co-operation, and in particular how to use an Air Force so as to give the maximum help to troops fighting on the ground.

The only fly in the ointment as we go to press is the news of a British withdrawal in Burma. The Japanese have reinforced their troops on the Arakan front. There, too, the British and Americans hold air superiority, but sea and land superiority too are necessary to produce victory.

BRITISH & U.S. AIR LOSSES to MAY 8th

	Over G.B. A'crft.	Continent B'brs.	Continent F'trs.	Middle East A'crft.	N.W. Africa A'crft.
May					
2	0	0	4	0	2
3	0	11	2	0	8
4	0	32	4	0	0
5	0	0	1	0	4
6	0	0	0	1	10
7	0	1	1	0	4
8	0	0	0	0	12
	0	44	12	1	40

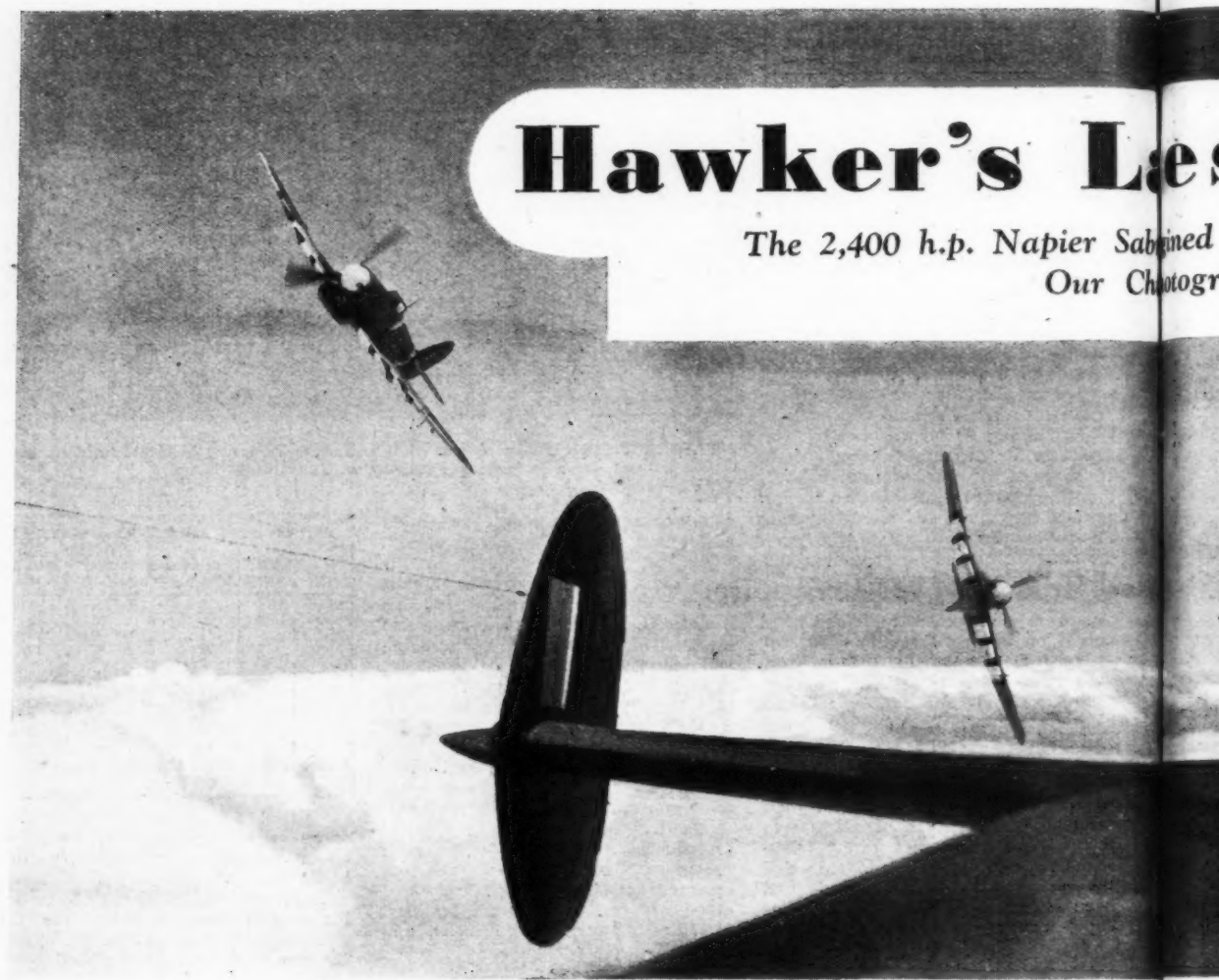
Totals: West, 5,916; Middle East, about 2,090: North West Africa, 650.

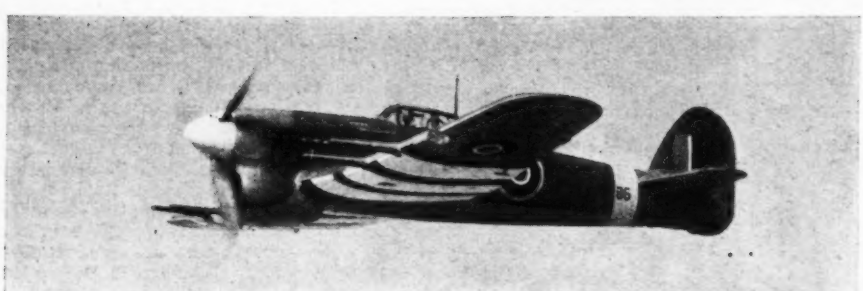


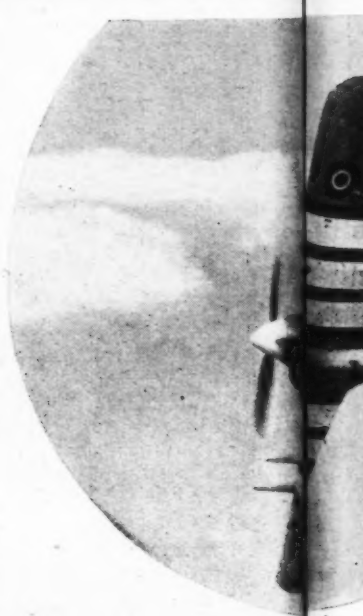
LOFTY BUT LEVEL: An advantage of the tricycle undercarriage on transport aircraft is that it provides a level floor when cargoes are being loaded and unloaded. But in the case of the four-engined Douglas Skymaster (C-54) it is a high-level floor necessitating the provision of hoisting gear.

Hawker's Le

The 2,400 h.p. Napier Sab ined
Our Ch otogr





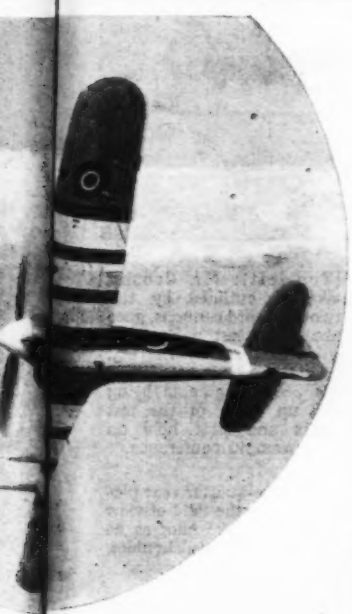


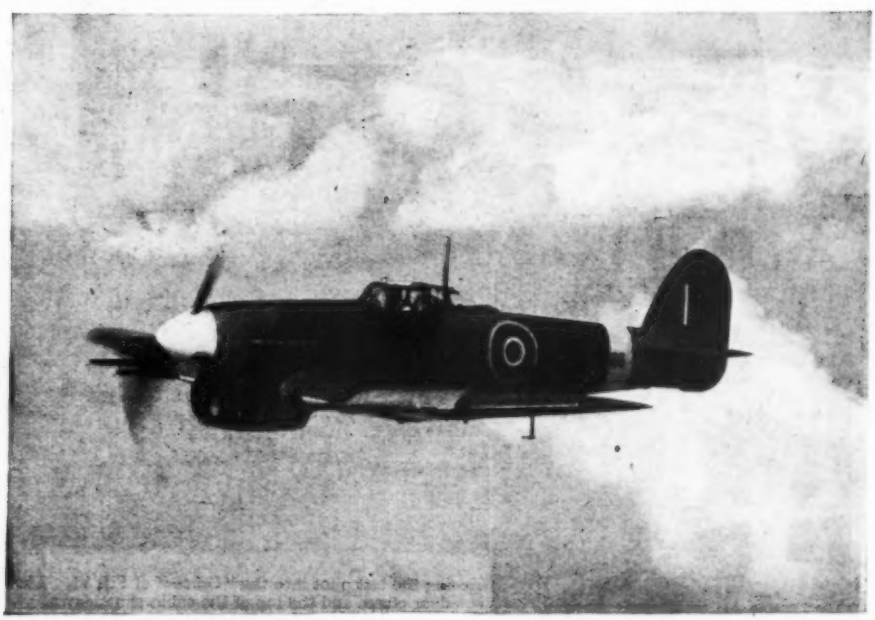
ON these two pages and overleaf appear a series of flying and ground views of the Hawker Typhoon. This newest recruit to the armoury of Fighter Command is shown in all its aspects. Across the top is a panorama composed of individual shots of Mr. John Crosby Warren, who is in charge of the production-testing of the Typhoon, disporting himself behind the tail of the aircraft carrying the photographer.

In the vastness of space above the clouds, with the agility imparted by some 2,000 h.p. and a clever pilot, the Typhoon loses all appearance of being a fearsome engine of war. In the silence imposed by the noise of the aircraft bearing the observer, it sweeps unheard across the blue inverted bowl with a gay lightheartedness which is a delight and a thrill

Lest Fighter

r Sabined Typhoon Performs for
r Chotographer





HAWKER'S LATEST FIGHTER

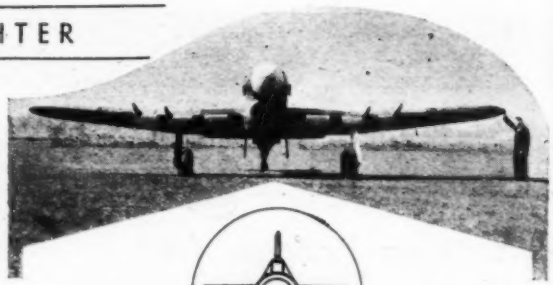
to watch. Truly man has conquered the upper regions—at a cost.

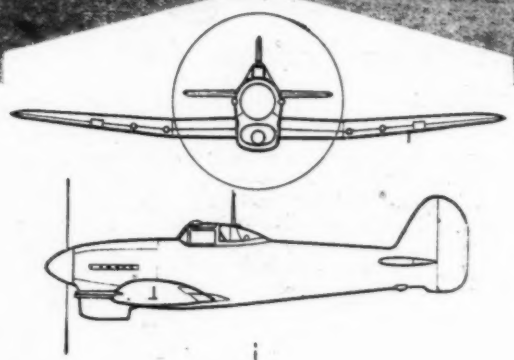
Some Features

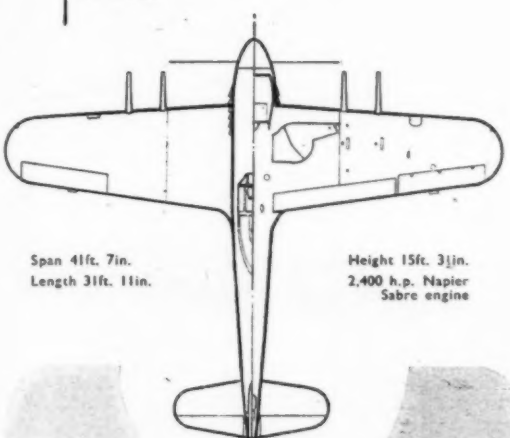
The head-on view on the right shows how clean the Typhoon is with the engine running. Despite this cleanness and the high wing loading, the approach and landing speeds—contrary to some reports—are not unduly high. With flaps down the approach is made at 105-110 m.p.h., and the touch-down at 70 m.p.h. If, for any reason, the flaps are not in operation, the speed of the approach glide rises to about 125 m.p.h. and the landing speed is correspondingly increased to 105 m.p.h.

It is also clear from these photographs what an excellent view is provided for the pilot. The only obstruction to an all-round view is the slab of armour plate which protects his head. The roof of the cockpit hinges on the port side and carries a see-behind mirror in a streamline "blister." Entry is by a half-door, which hinges forward against the slipstream. In case of emergency the whole cockpit cover can be jettisoned immediately. Just aft of the cockpit door is a hand-hold, and two steps are provided, one on the trailing edge of the wing and one hanging below the fuselage. All of these are spring-operated. The step on the trailing edge automatically closes as the foot is taken off it, and the closing of the hand-hold causes the fuselage footrest to retract into the body. All three wheels retract; the main ones inwards and upwards, which provides a wide track, and the tail wheel moves forwards and upwards.

The Napier Sabre engine is started by explosive cartridge and not by electric battery and starter, such as is usual practice with Merlin-engined fighters. Provision of radiator area for the main and oil cooling of a 2,400 h.p. liquid-cooled engine is a major problem in design. In the case of the Typhoon the radiator and oil-cooler units are housed beneath the nose in a cowling nearly as deep as the engine itself.

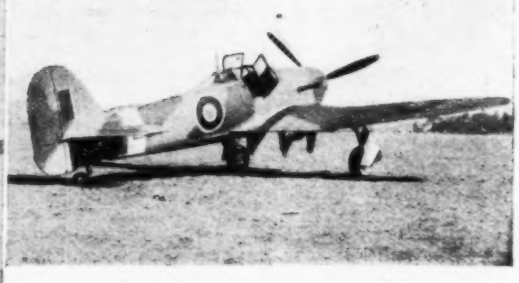




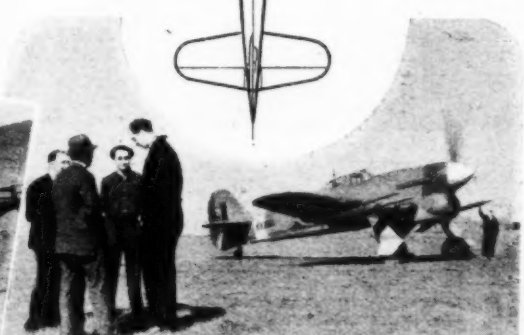


Span 41ft. 7in.
Length 31ft. 11in.

Height 15ft. 3¼in.
2,400 h.p. Napier Sabre engine



Seeing the test pilot into the "Office" of Fiji VI. The door closes and the top of the cabin shuts down.



(Top left): Mr. Crosby Warren, outlined by the two starboard cannons, goes aboard to test a Typhoon subscribed for by the Fiji Islanders. (Above) While the Sabre engine is being run up some of the test pilots and staff hold an impromptu conference.

This three-quarter rear picture shows the field of view obtained by the pilot as he glances over his shoulder.

HERE AND THERE

Sir A. Tedder Honoured

AIR CHIEF MARSHAL SIR ARTHUR TEDDER has been elected into an Honorary Fellowship at Magdalene College, Cambridge, the place from which he took his degree in history in 1912 and won the Prince Consort Prize.

Still a Pilot

INCIDENTALLY, when Mr. Wendell Willkie visited the Allied forces in the Middle East, Sir Arthur flew him on a personally conducted tour over the front lines in a Fieseler Storch captured from the Germans.

Mr. Willkie refers to this incident in his book, *New World*, though he does not actually mention the name of the aircraft. His description of its characteristics, however, makes it fairly obvious.

U.S. Production Figure

THE United States target of 7,000 aircraft a month will in all probability be reached this month according to Mr. Donald Nelson, Chairman of the War Production Board. He said recently that from now on production of aircraft in America will increase each month, the March figure being 6,200 aircraft, 500 of which were heavy bombers.

Empire Air Service

LORD BENNETT, former Prime Minister of Canada, in a talk to the Publicity Club in London, put in a plea for an Empire Air Transport system to help in the development of Imperial policy. The Dominions should be consulted, he said, in all matters of foreign policy which affect their welfare, and an Empire air service would enable conferences to be called in any of the Dominion capitals within twenty-four hours.

Atlantic Flights

THE North Atlantic Return Ferry Service of British Overseas Airways has just completed 400 flights between the United Kingdom and Canada in eighteen months.

Pilots and crews of R.A.F. Ferry Command who deliver bombers to Britain return to Canada in this way, and Government passengers are also carried. Aircraft flying to this country carry more Government passengers and freight.

An Old Trick

ALLEGATIONS by the enemy that the R.A.F. have dropped explosive pencils and fountain pens in Germany and Italy "with the intention of killing children" constitute a Nazi trick with which we are already only too familiar, for booby traps of this very kind have been used by themselves in the Western Desert and, we believe, in Russia.

The infamous charge was, of course, emphatically denied by a senior officer of the R.A.F., though this was hardly necessary.

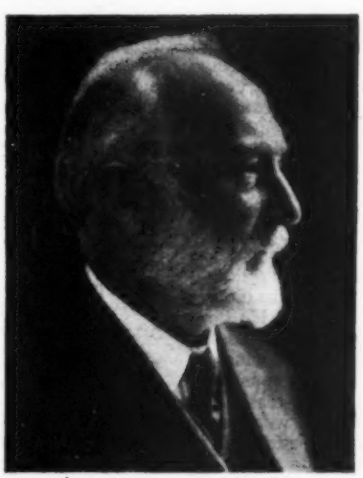
Dr. Goebbels should remember, when he is concocting his propaganda, that we are a "decadent" nation, and would never be able, therefore, to emulate the magnificent ruthlessness of Hitler's followers to the extent of deliberately murdering little children—as his Stuka pilots did in France, for instance!

HOME FROM CANADA: Air Chief Marshal Sir Frederick Bowhill has returned from Canada to take over his new duties as A.O.C.-in-C. of the R.A.F. Transport Command. Taken before leaving Montreal airport, the picture shows (left to right) Mr. Morrison W. Wilson, President of the Royal Bank of Canada and a pioneer of the Atlantic ferry, Air Chief Marshal Bowhill, Air Comdre. G. J. ("Taffy") Powell, captain of the Liberator, and Mr. Harold M. Long, who was chief executive officer of the Atfero under M.A.P.

Death of a Pioneer

THE name of Hans Renold, who died recently at the age of ninety, was familiar to all the older cyclists and motor cyclists, for in 1880 he invented the bush roller chain—the type which made their mounts practical vehicles and which has since become the basic design of all precision power transmission chains throughout the world. In 1895 he invented the inverted tooth, or silent chain.

Hans Renold was a first-rate engineer, who insisted on quality above all else, and he was also a pioneer in social conditions and a very enlightened employer. As far back as 1896 he introduced a 48-hour week at his Manchester factory, and his workers enjoyed holidays with pay long before anyone else thought of such a thing.



The late Hans Renold, inventor of the bush roller chain.

Back to B.O.A.

MR. A. F. BURKE, O.B.E., who has been deputy managing director of Napier's for the past year, has returned to British Overseas Airways Corporation as engineering director.

Mr. Burke has been away from the corporation for three years, having been seconded to the M.A.P. for special duties in connection with the aircraft civilian repair organisation and later as Technical Liaison Officer to the Controller of Research and Development.

Appreciation from Russia

THE Prime Minister recently received the following personal message from Premier Stalin:—

"I welcome the bombing of Essen, Berlin and other industrial centres of Germany. Every blow delivered by your Air Force to the vital German centres evokes a most lively echo in the hearts of many millions throughout the length and breadth of our country."

This message was passed to the Commander-in-Chief, Bomber Command, who has circulated it to his squadrons.

Splendid Record

MORE than 2,000 A.T.C. cadets have, during the past year, received practical flying training in gliders, and not a single one of them has been involved in an accident. Some twenty schools in various parts of the country have been operating gliders, and altogether it is estimated that about 10,000 launchings have been made, to date, so this safety record speaks extremely well for their instructors.

As many of the gliders used have been built by the cadets themselves, this freedom from mishap is also a tribute to their workmanship no less than the technical skill of those who have supervised their work.

The A.T.C. has, incidentally, just completed its second year (it was founded in April, 1941), during which some 25,000 cadets have gained their proficiency certificates, and 102,679 cadets attended the summer training camps in 1942.

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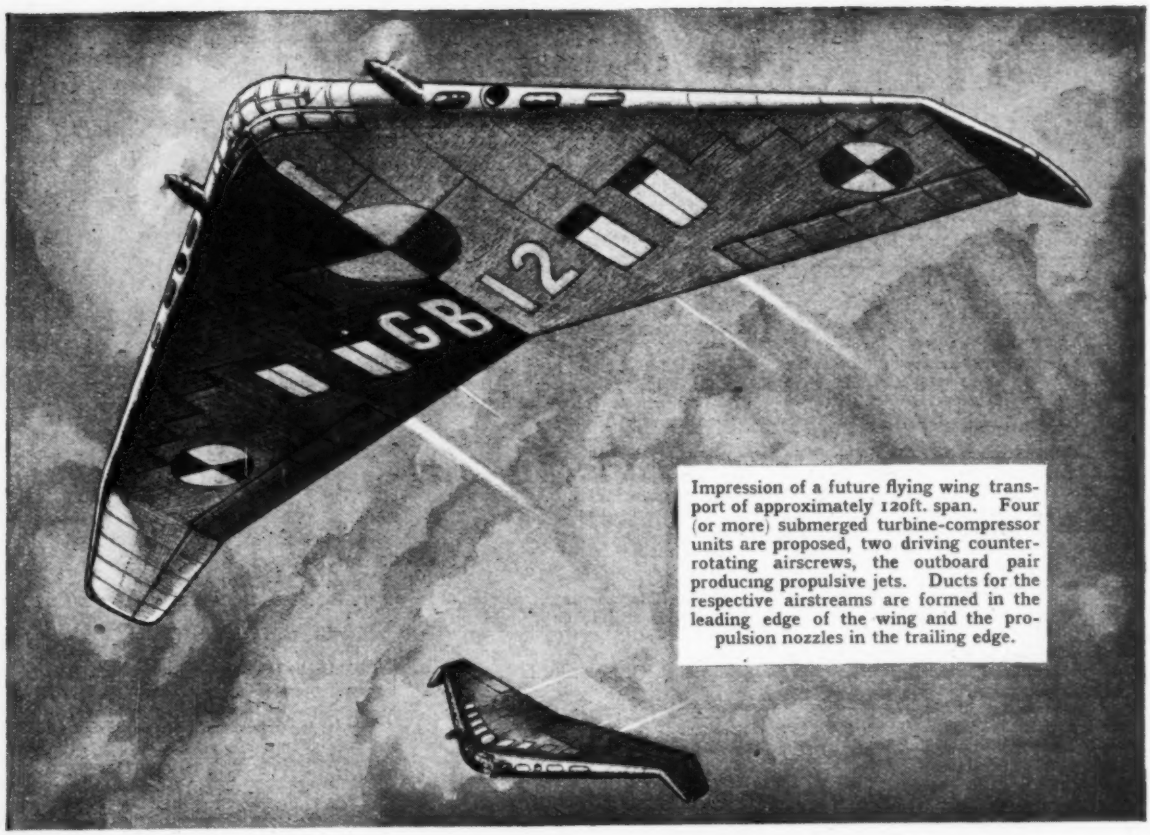


Impression of a future flying wing transport of approximately 120ft. span. Four (or more) submerged turbine-compressor units are proposed, two driving counter-rotating airscrews, the outboard pair producing propulsive jets. Ducts for the respective airstreams are formed in the leading edge of the wing and the propulsion nozzles in the trailing edge.

TURBINES and the FLYING WING

AIRCRAFT MAY BE REVOLUTIONISED BY APPLICATION OF THE GAS TURBINE : SOME POSSIBILITIES DISCUSSED

By G. GEOFFREY SMITH, M.B.E.

IN the summary of advantages of turbine-compressor combinations for jet propulsion* it was mentioned that their convenient shape enabled the units to be completely enclosed in the fuselage or wholly submerged in the wings. The desire to eliminate the extended fuselage and tail has been the aim of designers for many years, new aircraft of such a character having been introduced from time to time since 1910, when Junkers patented the *Tragflächen* (literally carrying surface), from which arises the designations "all wing" or "flying wing." In those days less was known about stability, the most critical factor in tailless design. Col. J. W. Dunne was one of the pioneers who realised the advantages and disadvantages of the tailless type—not to be confused with the modern conception of a flying wing, that is a deep-section all-wing design which provides accommodation internally for all the motive units as well as the passengers, crew and cargo. He foresaw that to ensure longitudinal stability it was necessary to sweep back the wings sharply so as to get the wing tip control surfaces (usually both elevators and ailerons) well aft of the centre of mass, thus giving them a reasonable "lever arm" to work upon. His experiments were made in the period 1910-1912 with monoplanes vee-formed in plan and having downward-swept wings tips.

About 1921 Lippisch experimented with models of tailless aircraft and his work was assisted by Hermann Köhl. Together from 1928 they produced five tailless monoplanes named the Delta, the last two having dihedral wings, the tips of which were (like the English Dunne design) turned sharply downward to improve stability. Lippisch designs employed a thin fabric-covered wing with a central engine and control cabin. 30 h.p. Bristol and Fafnir engines were used with tractor airscrews. In support of his original layout he said that against the originally accepted theoretical conceptions, it is possible to achieve the necessary dynamic stability without any major difficulty.

Early British Types

Also during the years between the wars, Capt. Geoffrey Hill revived interest in the tailless type with his "Pterodactyls" which were demonstrated at British flying displays. In them the sweep-back was rather less pronounced than in the Dunne, but still fairly considerable.

Flying wings, by virtue of their reduced "wetted area" and freedom from protuberances, promise greatly increased efficiency, particularly if submerged power units are employed. With the rapid increase in the size of aircraft being built and projected (100 tons all-up weight and wing spans of 200 feet are now common talk) a modern trend aiming to reduce aerodynamic drag is completely to enclose the power units inside the wing. So desirable is this feature regarded by certain designers that horizon-

Flight, October 9th, 1941.

tally opposed, horizontal H and acute X type engines have been specially developed for submerged installation. An essential feature of a flying wing is its relatively deep wing section. With modern knowledge this presents no insuperable difficulty; consequently the problem of housing the cabin and power units as well as providing accommodation for passengers and crew is greatly facilitated.

In contemplating a large air liner for example, aerodynamic efficiency, cleanness of design, plus the practicability of flight engineers gaining access to the engines by means of gangways formed in the wing section, all indicate the desirability of total enclosure of the motive units, whatever form they may take.

Consideration of these facts lends emphasis to the view that the advent of the high-speed gas turbine with its smooth-running characteristics will revolutionise aircraft design, not merely from the angle of propulsive power but also accelerate a change in the aircraft structure basically and fundamentally. One foresees that instead of concentrating thought on the possibility of adapting normal types of monoplanes to propulsion by turbine-compressor units, either driving airscrews or producing a propulsive jet, the perfection of prime movers of the type under discussion will bring about a complete transformation. That is, new aircraft will ultimately be designed around the power units rather than adapting and modifying orthodox types of aircraft to receive them.

An Enveloping Wing

From this train of thought the idea of the flying wing emerges as a logical, progressive development. The idea, as already suggested, is as old as the industry itself, but only in recent years have advances in aerodynamic and structural knowledge brought the thick section wing to the stage of practical realisation. High-powered turbine units would appear to offer great promise for the large aircraft of the future, particularly those designed for high-speed operation at high altitude. The views of Mr. F. W. Caldwell, Director of Research, United Aircraft Corporation, are of interest in this connection. He is reported to have stated recently that some form of jet propulsion, accompanied by change in heat cycle, in the ratios of air to fuel, and increased cruising speeds (above 300 m.p.h.) offers hope, at least, for lowering the limit of fuel consumption set, at present, by the screw propeller. Furthermore, that at 40,000ft. and 150 m.p.h. the propeller and engine combination is twice as good as the jet, that at 300 m.p.h. neither has the advantage over the other, whereas at 550 m.p.h. the jet is twice as good as the engine-propeller combination.

Probably the latest conception of an aircraft designed to eliminate unnecessary drag is the Northrop flying wing, and a flying scale model with two "flat" type 65 h.p. four-cylinder Lycoming engines and later 120 h.p. six-cylinder air-cooled Franklin engines submerged in the wing has been tested in America, as recorded at the time. The model has a 38ft. span and is 17ft. long. After the tests in 1940 it was reported that adequate controllability and stability about all three axes had been achieved, obtained through the shape of the wing rather than through the use of external fins, rudders, stabilisers or other auxiliary surfaces. The wings are swept acutely backward and the tips dropped downward in a direction opposite to the dihedral of a normal wing. In this it follows the example of the designs by Dunne and Lippisch. These wing tips take the place of the conventional control surfaces and Mr. J. K. Northrop advances the claim that its use makes it possible to obtain almost any desired combination of lateral and directional stability without loss of lift. The horizontal reciprocating engines are housed within the wings and drive pusher-airscrews.

Thus if it be accepted that progress with the "all-wing" design has been such that it is now as stable and manœuvrable as conventional aircraft, the equally modern power plant of compact circular shape with few excrescences as represented by the turbine-compressor combination would suggest itself as an ideal form of power unit for development with an aircraft of this character. It has been estimated that a flying wing has from 33⅓ per cent. to 50 per cent. less total drag than a normal type, which implies that considerably less horse-power is needed to attain the same speed. Since a jet propulsion units is considerably lighter in weight than an equivalent reciprocating engine with its many auxiliaries, a double advantage is suggested on paper by marrying the flying wing to the gas turbine. It seems a logical development with attractive possibilities.

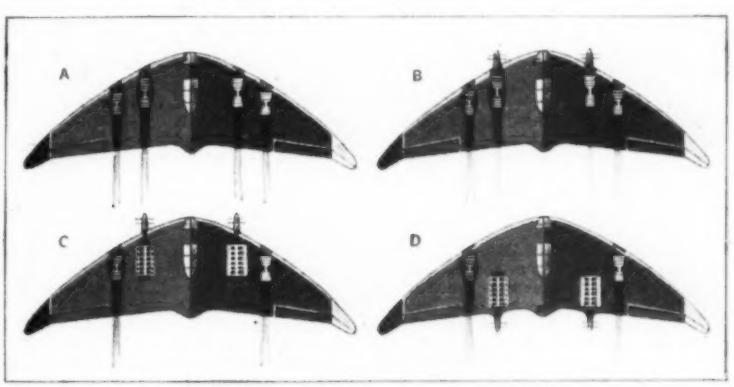
The provision of a pressure cabin is a necessary consideration for future air liners of a type with motive power which excels at the higher altitudes. The extra weight entailed by pressurising the cabin would seem justified.

A tricycle undercarriage is also a desirable part of the specification to enable a natural level for such a large multi-engined aircraft and ease of passengers in moving about when the aircraft is on the ground. As already stressed, a very low build is possible since little ground clearance is required with the comparatively small-diameter counter-rotating airscrews likely to be employed, and less still if propulsive jets are used exclusively. Inside the aircraft a small independent auxiliary engine or turbine driving a D.C. generator would be desirable to take care of the many electrically operated components and mechanisms such as starters, airscrews, undercarriage, flaps, lighting, and radio.

"Mixed" Power Units

By way of illustration I have roughly sketched for execution by R. E. Poulton an impression of a large flying wing transport embodying control surfaces of the Dunne, Lippisch or Northrop type. It is of approximately 120ft. span and powered by four submerged turbine units. The inboard pair drive counter-rotating airscrews, whilst the outboard units are of the jet propulsion type. A feature of this bare layout is that ducts for the respective air-streams are arranged in the leading-edge of the wing and the propulsion nozzles in the trailing-edge.

Since the weight of the airscrews is considerable, it is suggested that they would be employed on the inner pair in order to concentrate weight near the central axis and permit lighter construction. In this arrangement the efflux of the turbines could be utilised as auxiliary propulsive jets. By suitable ducting, as much of the heat as necessary could be diverted along the leading-edge of the wing and control surfaces to prevent ice formation



Four suggested arrangements of power units on flying-wing aircraft

A. Four continuous combustion turbine and axial compressor type jet propulsion units

B. Two turbine-driven counter-rotating airscrews and two jet propulsion units.

C. Two reciprocating engines driving counter-rotating airscrews and two jet propulsion units.

D. Two reciprocating engines driving counter-rotating pusher airscrews and two jet propulsion units.

TURBINES AND THE FLYING WING

building up during adverse atmospheric conditions.

Variants of this scheme might with advantage form a subject of investigation. For example, as one of the drawings indicates, the four (or more) turbine units could be of the jet propulsion type without airscrews, or two of them might drive pusher type propellers.

A further modification would be to use a "mixed" system on a four-unit or six-unit design. That is, the inboard pair might be orthodox two- or four-stroke reciprocating engines and the outboard units turbine-jet propulsion plants. The advantages suggested by such an arrangement are that reciprocating engines with counter-rotating airscrews would enable a quicker take-off and rate of climb, and aid manœuvrability of the aircraft on the ground. At the higher altitudes, as the efficiency of the reciprocating engines tended to fall away, the jet propulsion units would compensate for the loss, and could also possibly be used as the sole means of propulsion for economical cruising. Under certain conditions of high-altitude flight, particularly when operating over long ranges, it might be an advantage if the reciprocating engines could be stopped to conserve fuel, propeller blades fully feathered, and the aircraft carry on solely by jet reaction.

Scope for Designers

The idea of associating conventional petrol reciprocating engines driving airscrews with the combustion gas turbine and compressor plant producing a propulsive jet was referred to by the writer in *Flight* of November 26th, 1942, in a note emphasising the urgent need for a Government policy on post-war commercial air transport. Some time prior to that date, and following a talk with a non-technical artist, a futurist drawing was produced of a mammoth long-range air liner embodying every travel comfort for world-wide transport. The drawing showed eight reciprocating engines driving counter-rotating airscrews, the power units being submerged in the wings, and independent or subsidiary means of jet propulsion by means of a gas turbine-compressor combination located in the tail of the fuselage.

Thus, in the likely event of the flying wing being combined with the highly promising turbine motive unit, many alternative methods of employing them individually or collectively offer considerable scope for the ingenuity of designer and project engineer. It is obvious that should a part of the power plant be in the form of reciprocating engines or turbines with airscrews, the latter may be of the tractor or pusher type.

All things considered, if the small-scale flying wing has attained the stage of progress that its protagonists aver, the way is open for the development of large transport aircraft on these lines. The smooth-running gas turbine enclosed within the wing is a most attractive power unit for such a design by reason of its convenient contour and other considerations. Jet propulsion is probably the most suitable for high-speed, high-altitude flight, and in the case of commercial transport it has already been stressed that the possibility is opened up for the use of cheap fuels.

Should aircraft structures and power units follow the trend of development suggested, in ten years' time present-day aircraft will appear as old-fashioned and out of date as a ten-year-old biplane does to-day.

Book Reviews

603 (City of Edinburgh) Fighter Squadron. By A. Scott Kennedy. Pillans and Wilson, Edinburgh. 1s. 6d. net.

IT was in the days of the late Squadron Leader Murray-Philipson that *Flight* first became personally acquainted with the City of Edinburgh Squadron, and a series of visits to Turnhouse have left very pleasant memories of warm hospitality and of admiration for a tremendously keen lot of men doing work of national importance with great gusto and extreme efficiency, without any desire of reward or profit. They gave the impression that if ever another war broke out they would take their place worthily beside the regular squadrons.

It was therefore with a most gratifying feeling of having said "I told you so" that *Flight* learnt that the German raid on the Fleet in the Forth on October 16th, 1939, had been met and foiled by the Spitfires of the two Auxiliary squadrons of Edinburgh and Glasgow.

In the fourth year of the war this book has been written as a partial history of the doings of the squadron, and the profits of its sale are to go to the squadron benevolent fund. The story cannot be told in full, but what is available has been well written and the little volume is well illustrated.

After the first engagement over the Forth, the squadron came south to take part in the Battle of Britain. In the course of it, No. 603 shot up the Italian contingent. Later it went to Malta and shared in the glorious defence of that island. By that time it had become merged in the R.A.F. pool, and was no longer a distinctively Auxiliary squadron, bound up closely with the City of Edinburgh. In fact, when it flew off the deck of the U.S. *Wasp* and landed at Malta there were only two Scots among the pilots. It had previously had to part with its ground staff, much to the regret of all.

During the Battle of Britain the squadron, still recognisably the Edinburgh squadron, reached its century of enemy aircraft shot down. Its score is now much higher.

We cannot forbear quoting from a tribute paid by Air Commodore C. A. Bouchier, the C.O. of Hornchurch station. When the squadron first landed there, "the C.O," he wrote, "on getting out of his Spitfire, had his little 'side hat' perched on the back of his head; he meandered towards me with bent shoulders, hands in pocket, followed by, what seemed to me then to be, the motleyest collection of unmilitary young men I had seen for a very long time . . . Good heavens! (I suddenly remembered) its an Auxiliary squadron. . . . That explains it, but what have I done to deserve it? . . . As I write memories come crowding in upon me, and from their store I give you this of 603. They were, I think, the greatest squadron of them all."

Combat Report. By Hector Bolitho. B. T. Batsford, Ltd. 8s. 6d.

IT is undoubtedly a good thing for future ages that the story of one fighter pilot should have been written by an accomplished biographer. While a war is in progress it occupies the chief part of the attention of everybody, belligerent or neutral. Once the guns have been silenced, most people set themselves to forget all about it. Has not the war of 1914-18 already become a subject which bores? Has it not even sunk into just a bit of "1066 and All That"?

Yet, fortunately, there are always some people who take an interest in history and in the gallant deeds of the past. In future ages such students will certainly wonder what sort of men were the fighter pilots of Britain who did such wondrous works. Mr. Bolitho has set out to tell them. He has chosen the career of a young man whom he just calls "John," whom he first met on a steamer coming back from Australia.

John had tried his hand at helping on a sheep farm in West Australia and found the conditions of life there beyond him. He believed that he had been a failure, and he confided to Mr. Bolitho that he had "an awful inferiority complex," and he felt quite hopeless about himself. However, he got a commission in the Air Force, and there he found himself. The war came, and he proved to be a fine fighter pilot in the famous No. 43 Squadron. In due course he won the Distinguished Flying Cross and later on a bar to it. But what was more significant than his personal prowess, he was given command of a squadron at Aldergrove, in Ulster, which had got "browned off" through being out of things for a long time. He worked it up into a first-class state of efficiency, and in doing so proved himself a fine leader of men. By that time he had acquired a definite superiority complex.

Mr. Bolitho believes that the Royal Air Force has some mystical influence on those of its members who are really worthy of it, and that it brings out the best in them. Probably this theory has not been expressed in so many words before, but its truth cannot be denied. There are other British institutions which have a similar effect on their members, but Mr. Bolitho seems to think that the R.A.F. is outstanding in this respect.

This is a book to which future ages will be able to turn for information on the psychology of one outstanding type of Briton in the war which began in 1939.

Bouquets from U.S.A.

T. P. Wright Speaks of Civilisation's Debt to Britain : Facts and Figures on Growing Aircraft Output : United Nations Can Preserve World Peace

SOME very complimentary remarks were made about England, her people, and her aircraft industry, by Mr. T. P. Wright, who is now chief of all aircraft production in the U.S., when he spoke at the Institute of Aeronautical Sciences Honours Night Dinner in New York after his return to America from this country. The function was held in the Grand Ballroom of the famous Waldorf-Astoria and was attended by 850 members of the U.S. aviation world, which was said to be a record number.

Mr. Wright's address was divided into three sections, and it was the first of these which dealt with his trip to England when he headed a mission to this country. Mentioning that a return mission from Britain was at that moment visiting America, he stressed the value of these exchange visits which lay, he said, not only in the interchange of ideas, but, more than anything, in the spirit of co-operation they engendered which he was sure would carry on after the war. And he then voiced an important point which nobody on either side of the Atlantic should forget.

"Let us not get the idea," said Mr. Wright, "that in this joint effort we are competing in any way—*there is plenty of war to go around!*"

Referring to the extent of bomb damage in certain areas, and how it evidenced what England had had to take, he said that America would everlastingly be in the debt of England; "no matter how much we may do now, the debt of ourselves and of civilisation itself can never be repaid."

Their mission was given a royal reception and everything was magnificently planned. In fact he thought the English did these things better than anyone else in the world. From the outset they had the general feeling of the determination of the English people, and this was shown more than anywhere else in the factories by the intensity of the labour effort. Particularly were they impressed by the job the women of England were doing, whether in uniform or in the factories where they now comprised more than 40 per cent. of the workers, and they were equally impressed by the way the British production effort was being carried on in the dispersed factories.

Good Control of Materials

"In some places," Mr. Wright explained, "there would be two or three assembly plants, with perhaps 40 or 50 small factories, garages and the like within a radius of 50 miles, building components for the assembly. In production, we noted, they were able to carry on with tools which, in general, were older than ours, and in matters of material control I think they have surpassed us. I heard very little of shortages of material in the many plants that we visited."

Effectiveness of British products at the fighting fronts, he went on, had demonstrated that their quality was good both in design and workmanship, and he cited the Merlin and the Spitfire as examples of the continuing development of types started some time ago.

"I think it is certainly true," said Mr. Wright, "that in this great effort in which our several countries are involved, we can be complementary to each other in our efforts. This can apply in engineering, wherein we exchange designs and thereby save time by eliminating duplicated effort; it can be demonstrated in production methods whereby we can exchange ideas and increase the output of each of us; and it can be shown in tactical and operational uses of aircraft, a notable example being the fact that we are now able to strike our enemy day and night."

On the subject of aircraft production in America, Mr. Wright told his audience that unbalance in distribution of materials was more in evidence than actual lack of materials, though there were quite serious shortages in certain instances. But man-power would be the final limiting factor in their production programme, and during a recent trip to the West Coast with other members of the Aircraft Production Board, the most disturbing thing to him had been the problem of man-power, certain phases of which were quite discouraging; absenteeism, for instance, was in some cases as high as ten per cent., on the average, of the workers absent each day from their jobs.

Must Solve the Problem

"I think this is a problem we must all attack by every means we can," Mr. Wright said, "because the unproduced airplanes represented by the potential production effort of those people who are wilfully absenting themselves from their work represents somewhere in the order of 500 airplanes a month. We simply cannot afford that much loss at this time; we must and will solve the problem."

There were problems connected with simplifying their programmes, but it had to be remembered that to simplify a programme, something had to be taken out of immediate production, and they felt that the 1943 output was so all-important that it was unlikely many types could be taken out of production, even though it might prove to be a good thing in the long run. They were, however, very favourably impressed with the way the aircraft industry had gone into line production, and he thought they had struck a very happy balance between the super mass production methods of the motor car industry and the previous hand-building type of work which small orders had necessitated in the aircraft industry.

An improved efficiency in the factories was also gratifying; the companies as a whole had been able to increase their efficiency in terms of man-hours per pound about on an 80 per cent. curve, and although the aircraft industry came in for a lot of "ribbing," the facts showed what had been done. In 1940 they had turned out just over 6,000 aircraft. In 1941 this rose to 19,300 and in 1942 to just under 48,000. It was an astonishing rate of increase, for in the month of December, 1942, they had produced almost as many aircraft as they had in the whole 12 months of 1940. But even that was not the whole story for, during the 1940-42 period the weight of those airplanes had also been steadily going up, so that, expressed in pounds of output, the ratio for the three years had been 1, 4, and 14, and in 1943 the rate of increase would continue. As evidence of the quality both of their aircraft and the men who flew them, the enemy losses as compared with their own had never been less than 3 to 1, and in many engagements went as high as 10 to 1.

Finally, Mr. Wright spoke on the subject of the United Nations, saying that the change from the defensive to the offensive made it appropriate to discuss the peace afterwards, as well as the winning of the war.

"With the advent of the airplane," he said, "the world now becomes of manageable size," and he went on to describe how, just as the invention of gunpowder made the castle no longer impregnable and so brought the feudal system to an end, to be replaced by a totally different political set-up, so the scheme of organisation which had been tenable up to the coming of air power could no longer be maintained. By virtue of its mobility, air power made the adequate policing of large territories possible, and aggression on the part of any power so minded could be prevented from starting. It seemed to him, therefore, that from this United Nations, established in war, there could spring something fine and lasting—a peaceful world order, policed from the air.

Behind the Lines

Service and Industrial News from the Inside of Axis and Enemy-occupied Countries

Jap Parachutists

QUOTING a Chungking report, a German broadcast states that Japanese parachute troops were employed during the fighting in the Tai Hang Shan mountains in the South-West of China. It will be recalled that about a year ago an announcement from Tokyo mentioned for the first time the formation of paratroops, which by the end of 1942 were said to number 12,000. Another report stated that parachutes made from paper had been invented by a Japanese scientist and perfected for the use of the army.

Production Methods

IN an article on the methods employed by the German industry, the *Nazional-Sozialistische Partei Korrespondenz* states that the efforts to reduce man-hours in the different industrial processes have met with considerable success. It is said that as a result of large-scale mechanisation it has been found possible to place one man in charge of four or five machines, and thus to increase the speed of production.

As an illustration of these achievements, the report claims that to-day only 18 major operations are required to produce a tank. In the aircraft industry as well, the conveyor-belt principle has been replaced by the "work tempo," which allows the worker to apply the necessary care to his work in an independent and unhurried manner.

The *Frankfurter Zeitung* states that the concentration and simplification of the aircraft and automobile piston industry and the introduction of new labour methods have resulted in a considerable increase of output. Without the employment of additional machines or man-power, 730,000 more pistons were produced during the past year than in the previous one. The saving in material amounted to several hundred tons of aluminium and over 1,000,000 kW. of electric power.

Italy's Loss

FOR the first time since the beginning of the war, an official communiqué from Rome gives the figure of missing and killed generals and admirals. Sixteen generals of the army and of the *Regia* are said to have lost their lives on different fronts. In the fighting in the Mediterranean area, three generals and two admirals are reported missing. Among the fallen generals are the names of the well-known Italian commanders, Malletti, Tellera, Volpini and Baldassarre.

Jap Rubber

ACCORDING to Press reports, the Japanese Military Administration of Malaya does not intend to limit the rubber production of that country. It is, in fact, expected in Tokyo that the production of Malaya and Sumatra, which has gone down considerably since the Japanese occupation, will soon reach its pre-war level. Since the supply will then be in excess of the Japanese requirements, the Military Administration of Malaya is to employ rubber for the manufacture of fuel substitutes.

It is stated that a simple chemical process will be used to convert Malayan raw rubber into fuel for army motor vehicles.

Migration

TWO more German firms have followed the general policy of strategic retreat. The well-known machine makers, *Schwerin Maschinbau*, is reported to have established new works at Grodno, in north-eastern Poland. In Kiev, in the Ukraine, a mechanical industry is to be established by the newly created United Steel Works Company, *Vereinigte Stahlwerke und Stahlbau Ukraine*.

A German report also states that a new government-controlled company has been formed for the exploitation of the peat resources of the Ukraine, and the conversion of this material for fuel under the name of *Torfgesellschaft Ukraine*, with headquarters at Rowno.

Finally, the well-known motor vehicle and engine makers, *Kloeckner-Humboldt-Dutz A.G.*, have registered a subsidiary company at Agram, Croatia, presumably with the object of starting production in that city.

Friends of England—Join Up!

A QUISLING paper in Belgium carries the following moving recruiting appeal for the "Walloon Legion" which the Germans have formed for "export" to the Russian front: "You like the English? All right. But the enemy we must crush *first of all* is Bolshevism. Join the struggle—enrol in the Walloon Legion at one of the following recruiting bureaux (addresses given)."

Poison Gas?

NY DAG reports that chemical factories in France which had hitherto produced germicides were ordered to cancel their production and go over to poison gas. A simultaneous trick adopted by German propaganda may also be of significance. Within different German detachments stationed in France, a rumour was spread that the German retreat on the Eastern Front was caused by the Russians' use of gas. Perhaps such rumours are designed to prepare the right mentality for the employment of gas on the front.

Air Transport

IT is officially announced from Bucharest that Rumanian air services which were temporarily suspended resumed their operations on May 3rd. Apart from the domestic airlines, the revival applies also to the Bucharest-Budapest-Vienna-Berlin service.

AFLOAT: A pneumatic dinghy used by *Luftwaffe* bombers. The equipment is composed of a sail, two oars, a compass, a rope-ladder and a small compressed-air cylinder. The dinghy can also be pumped up by means of a simple bellows.

Expansion

A FURTHER illustration of the German policy to develop production in the strategic rear is provided by a report from Poland. It is announced that a new company has been established in Krakow under the name of *Krakauer Gummiwerke A.G.* According to the entry in the commercial register, the object of the company is to manufacture different products from rubber, plastics and similar materials.

In Posen the local branch of the well-known German company, C. H. Knorr, reports a tenfold increase of its capital, an indication of the extension of the company's activities.

MERCHANT SERVICE...

SHIPS will not be superseded within such future as can be forseen today, but passengers will tend to use the air more and more where the time saving aspect of this mode of travel becomes necessary.

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GRUMMAN GOOSE I

IN service with the Air/Sea Rescue Service of the R.A.F., the Grumman Goose amphibian was originally designed in 1937 as a small commercial flying boat and for the more well-to-do among private owners who combined a love of the sea with that of flying. In its maker's list it was known as the G-21A, and the first military version was delivered to the U.S. Coastguard service in 1940, and was designated the JRF-2.

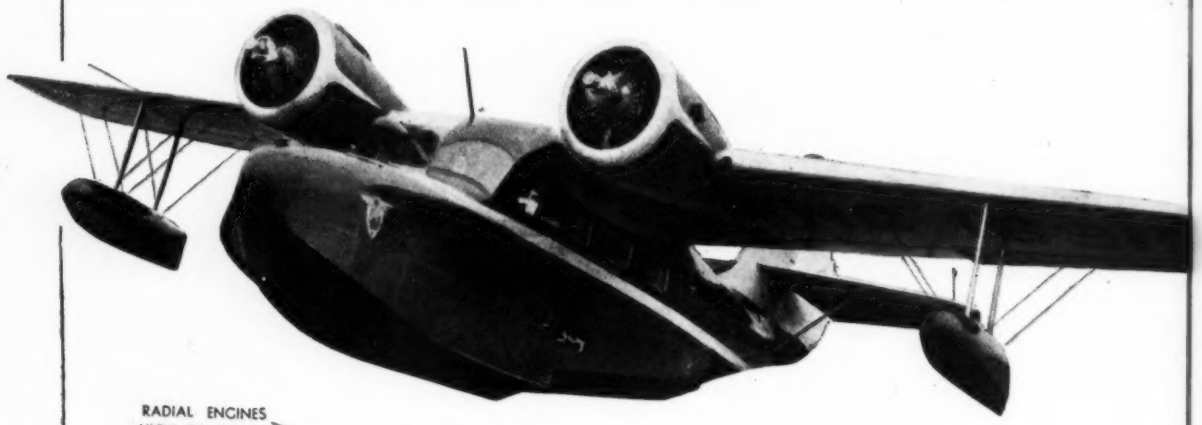
The Goose, however, is the military version of the G-21B, which embodies a number of detail improvements, and it is this type which is also in service with the R.C.A.F., both as a trainer and on coastal reconnaissance with operational squadrons, with the U.S. Army Air Force as the OA-9 (the letters stand for "observation amphibian") and with the U.S. Navy as the JRF-4. A still later Navy version is the JRF-6B, though not many of these are yet in operational service.

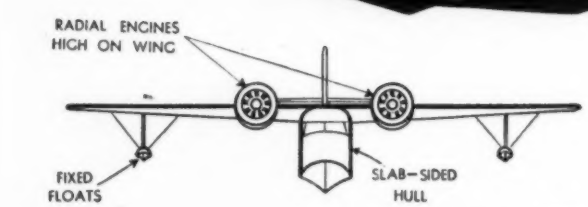
Thus the R.A.F. had the advantage, in adopting the Goose, of a well-proven type, for its immediate ancestors had seen plenty of service on a number of small airlines, both American and foreign, including service in the Netherlands East Indies. The Portugese Naval Air Service also acquired a number of them less than a year ago.

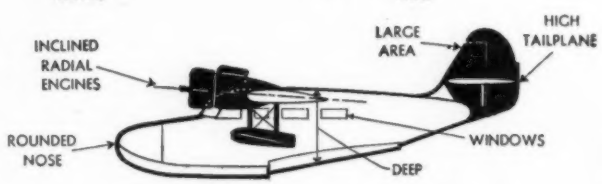
Powered by a pair of Pratt & Whitney "Wasp Junior" air-cooled radial engines, each rated at 300 h.p. at 2,000 r.p.m. at 6,500ft., and giving 450 h.p. at 2,300 r.p.m. for take-off, the Goose has a top speed of 184 m.p.h. at 5,000ft., and cruises at 173 m.p.h. at the same altitude. Its service ceiling is 21,000ft., and it has a very useful cruising range of 1,050 miles.

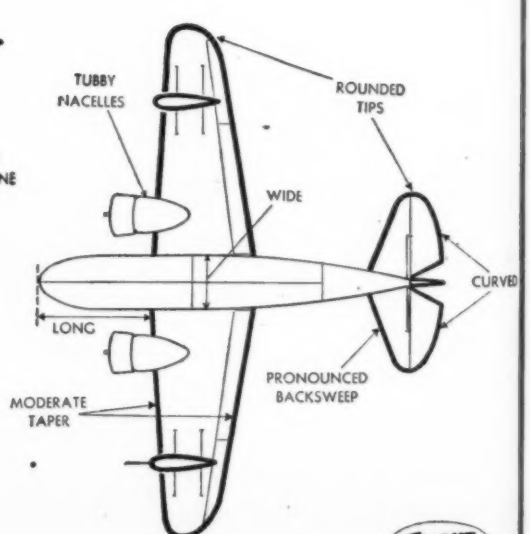
The hull of the Goose, an all-metal structure with riveted Alclad skin, has two steps and is of approximately rectangular section forward of the second step. Aft of that it becomes oval and is faired into the fin. Six watertight built-in bulkheads are provided.

The wings are also of all-metal structure, embodying a single tapered box-spar. From leading-edge to main spar it is metal-covered, but aft of the spar the covering is fabric, as is that of the ailerons, elevators and rudder. The split trailing-edge flaps, however, are metal-covered.









DIMENSIONS

Span	*49ft. 0in.*
Length	*38ft. 4in.*
Height	*12ft. 6in*
Wing area	*375 sq. ft.*

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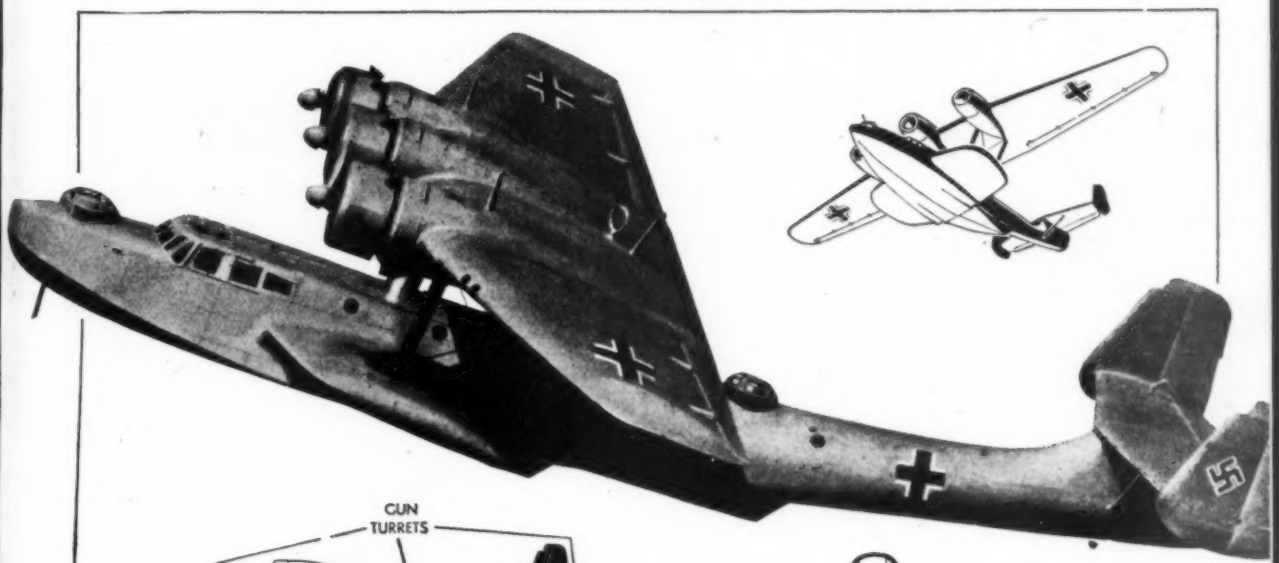
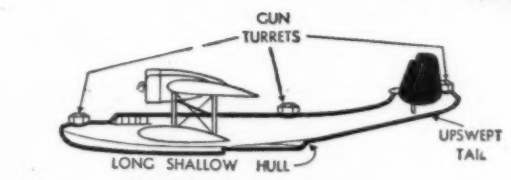
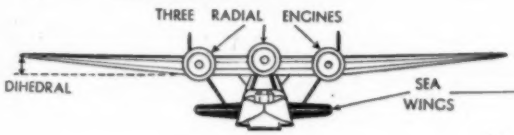
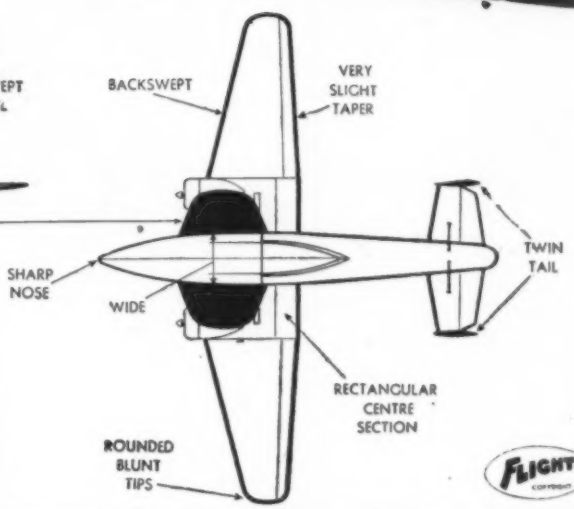
their Characteristics

DORNIER Do 24









DIMENSIONS

Span	*88ft. 7in.*
Length	*72ft. 1½in.*
Height	*19ft. 3in.*
Wing area	*1,162 sq. ft.*

THAT embarrassing situations must sometimes arise as the result of a country supplying aircraft to another country which later proves to be fighting on the other side cannot be doubted. During this war we had R.A.F. Marylands opposed to Vichy Marylands in the brief campaign in Syria, and Blenheims which we supplied to the Finns in their pre-Axis days have, in all probability, been since used against the best interests of the United Nations.

But it is a little surprising to find that the Germans, who knew all about this coming war long before we in this country were even prepared to admit its possibility, permitted the firm of Dornier to sell flying boats to the Dutch for the Netherlands East Indies Naval Air Force and also to build them under licence in Holland. Presumably business used to be business, even in Germany, and no doubt the heads of the Wehrmacht were quite confident of squashing all enemy-owned Do 24's at the first onslaught.

One of the few three-engined aircraft to emanate from German drawing-boards in recent years, the Do 24 is a parasol-type flying-boat with its high wings strut-braced to sponsons, or sea-wings. Its long, shallow hull somewhat resembles that of a Catalina, but it can readily be distinguished from this, and from the Do 18 and 26, by the fact that it has twin fins and rudders. In plan the wings have a rectangular centre-section and a sharply backswept leading-edge to the outer panels, the whole of the trailing-edge presenting a perfectly straight line.

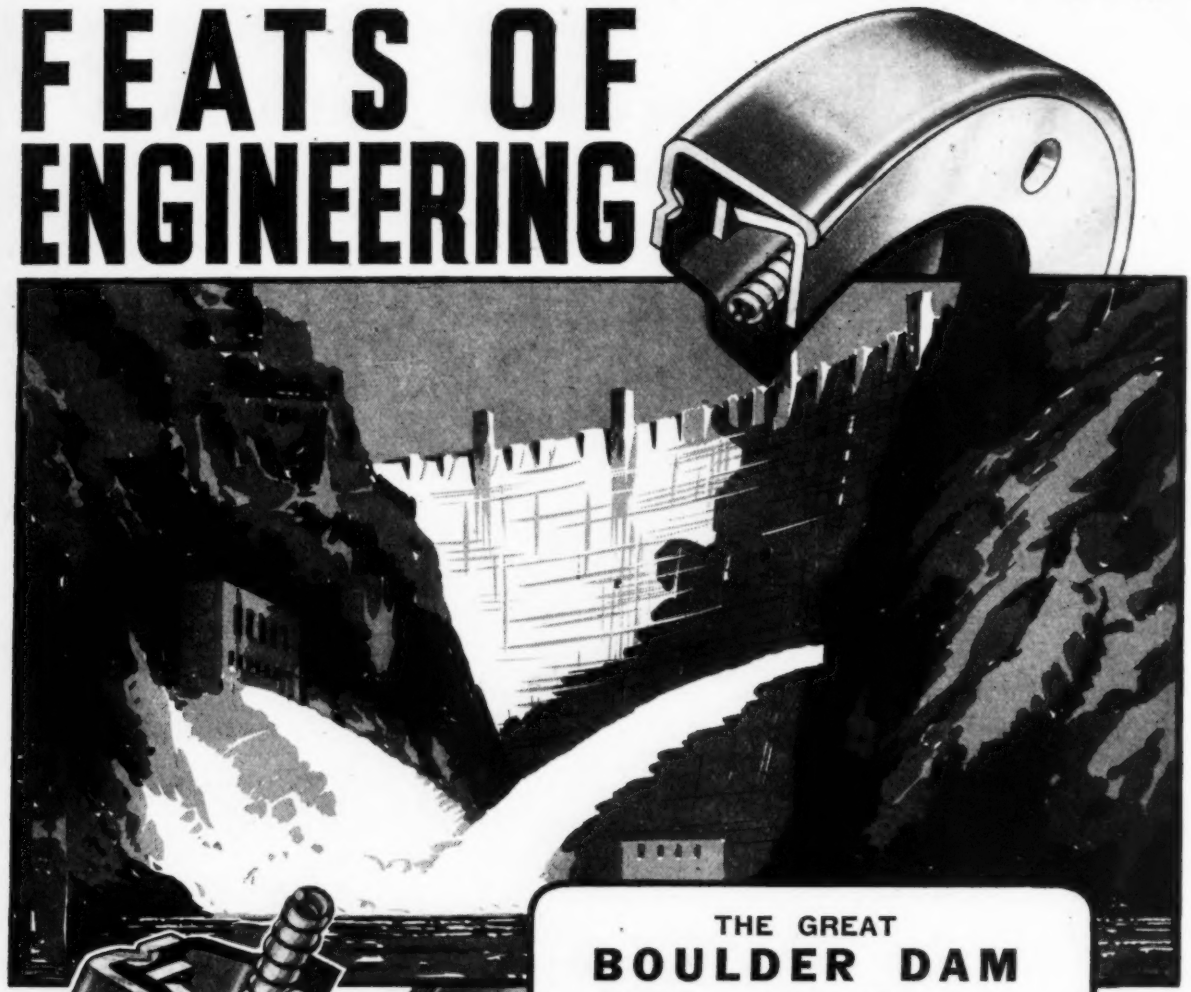
German production versions of the Do 24, which is still in service in the Baltic and elsewhere on what may be described as semi-operational duties, are powered by either Bramo-Fafnir or B.M.W. air-cooled radial engines of some 750 h.p. each.

The Dutch Do 24 flying boats are similar in every way as far as external appearances are concerned, but are fitted with Wright Cyclone engines.

The top speed is 195 m.p.h., cruising speed 161 m.p.h., service ceiling is 18,500ft., and range just over 2,000 miles.

Armament consists of three power-operated gun-turrets, one on top of the long nose, one dorsal and one in the upswept tail of the hull, and these may house either machine guns, 20 mm. cannon, or a combination of both.

FEATS OF ENGINEERING



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Notes from a Test Pilot's Diary—No. 6

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Fear

Its Practical Value to the Test Pilot : Individual Reactions Differ : Scope for Useful Study

By "WITNESS"

I HAVE never seen the subject of Fear as felt by the test pilot committed to paper, and, in fact, it is a subject on which coherent discussion with my colleagues is most difficult. They will talk about brushes with the Grim Reaper in a jocular and hilarious manner, but if you try to pin them down to a serious discussion on the question of fear, nothing but leg-pulling and line-shooting will result.

Outside our own ranks no one seems to think that our fears constitute a sufficiently real part of our existence to merit serious study. The fact that a pilot who literally does not know the meaning of fear would be a complete washout in testing seems to have been missed completely. Fear is one of the best safety-valves in preventing the human element from impinging violently against the laws of nature. Fear is the gatekeeper between reason and rashness.

Reality—Not Hollywood

The Hollywood test-pilot is devoid of fear, and so his value to screen audiences is in direct proportion to the number of aircraft he manages to break up in the air. The intelligent test pilot, on the other hand, knows that a machine which has begun to show signs of failure, and is then landed intact is one of the most valuable pieces of evidence possible in development. At the other extreme is the pilot whose nerves are inclined to get the better of him, and his anticipation of ominous happenings is so strong that his test of the aircraft does not go far enough to produce tangible results. In my belief, it is every bit as much a part of the test pilot's job to understand within himself, even if he will not and cannot discuss the matter openly, the proper assessment of his fear, as it is that he should be able to fly an aircraft.

Some years ago, quite soon after I had begun testing, I had the experience of a machine starting to break up in the dive. The circumstances were that I had been carrying out some tests over a period of hours fairly high up. My oxygen mask was not a very good fit and towards the end the oxygen supply ran out, so it was decided to return to base. Having been fairly well chilled through flying at that height, I naturally wanted to get down quickly once the job had been done.

So I turned for home and put the nose down in what was intended to be a moderate dive—but it was anything but moderate. My observer afterwards told me that his impression was that we went past the vertical. Had my senses been working normally there is little doubt that the mistake could have been rectified quickly, before any great speed had been attained. But due to the mental sluggishness imparted by oxygen starvation, it was probably several seconds before I realised what was happening. By that time the airspeed needle had almost completed its first circuit of the clock, and the engines were screaming their heads off although I had pulled the throttles right back.

Out of the corner of my eye I could see streamers of fabric starting to flutter, and to make matters worse the cockpit door blew open with a bang and created a miniature dust storm inside. A long time seemed to follow before my efforts to flatten out, restrained by the fear that the wings would break if I tried to pull out too quickly, had the effect of getting us back on to an even keel.

Surprise and relief followed when I found that not only did all the controls work, but that, despite a considerable area of fabric having disappeared from the wings, the machine continued to fly quite nicely.

Of course, that dive scared me stiff at the time, yet it was all over very quickly. On the whole, I think it was much more frightening to think about what had happened and to look at the condition of the wings afterwards. Bits of the fabric had begun to foul the aileron controls at two of the sprockets, and it was just luck that the ailerons had not seized solid. Most frights in the air seem worse in retrospect, with one possible exception—being lost.

Having done a good deal of cross-country flying before I started testing—probably more than the average—I have had ample opportunity to get used to the feeling of being lost. Yet I think it is still one of the most frightening things—in bad weather, in failing light, when the fuel supply is getting short, or when you know that your engine is not likely to last much longer. The worst of being lost is that the situation usually starts gradually and then may last a long time, relatively; minutes against the seconds of other testing incidents.

Individual Idiosyncrasies

Different pilots have different fears, and the reaction to each situation will vary according to the individual. For instance, I know of a pilot who had a perfectly good record on operations in fighters both by day and by night, yet when he was asked to stall a machine which had been in production some time and was known not to be vicious, he refused. In the same way, many pilots who are prepared to fly happily in almost any weather when their machine is equipped with wireless seem unduly sensitive to moderate visibility and lowish ceilings when the wireless isn't there.

At various times competent medical authorities have made detailed studies of the neurosis or fear-tendencies of almost every branch of flying except testing. Air-line pilotage and service operational flying have certainly received such attention. But I should like to see our profession given a similar study, for, besides debunking the ballyhoo that test pilots do not know what fear is, an understanding of these principles could be used to reduce unnecessary strain and increase our usefulness.

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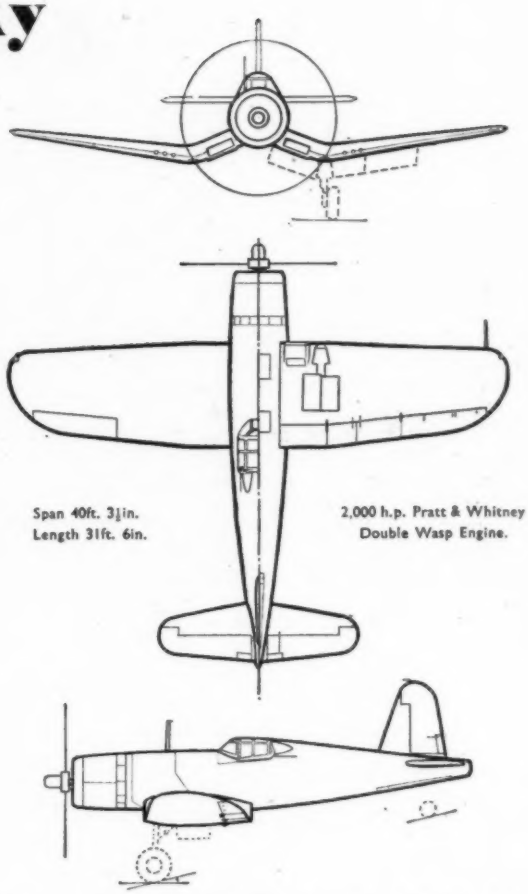
Vought-Sikorsky Corsair

New Pictures of America's Newest Shipboard Fighter : A 400 m.p.h.-plus Type for U.S. Navy

WHEN the Corsair first appeared it was credited with a speed of 366 m.p.h. at 16,500ft. It was then powered by a Pratt and Whitney Double Wasp of 1,500 h.p. at 2,400 r.p.m., with a take-off power of 1,850 h.p. The output of the Double Wasp has been stepped up until it is now claimed to give something in the region of 2,000 h.p. The airframe has also undergone slight modifications—the nose is slightly longer and the cockpit cover redesigned—and it is said that the sum of these improvements has resulted in the maximum speed going over the 400 m.p.h. mark. A jump of 40 m.p.h. is a big increase at these speeds.

Despite the fact that it complicates manufacture to a severe degree, the cranked wing root arrangement has been adhered to in order that the wing should make as near as is possible a right angle to the fuselage. This lessens interference drag, which is a fruitful source of disappointing top speeds, and may reduce tail buffeting. Another undoubted advantage of the cranked wing root is that the undercarriage legs are kept short, without bringing the airscrew perilously close to the ground. As it is, to accommodate the extra horses of the Double Wasp it has been found necessary to employ a four-bladed airscrew in place of the three butter-pat-bladed model shown in the ground photograph on this page. Both the three-bladed and four-bladed airscrews are Hamilton Standard hydromatics, which correspond roughly to the de Havilland hydromatic built over here.

It is interesting to note the size of radiator now required to cool the oil alone of a 2,000 h.p. engine. The oil radiator surface of the modern high-powered, air-cooled radial engine is greater than that required for the main cooling of a liquid-cooled engine a few years back.



A three-view general-arrangement drawing of the Vought-Sikorsky Corsair shipboard fighter.

An interim version of the Corsair with a three-bladed Hamilton hydromatic airscrew.

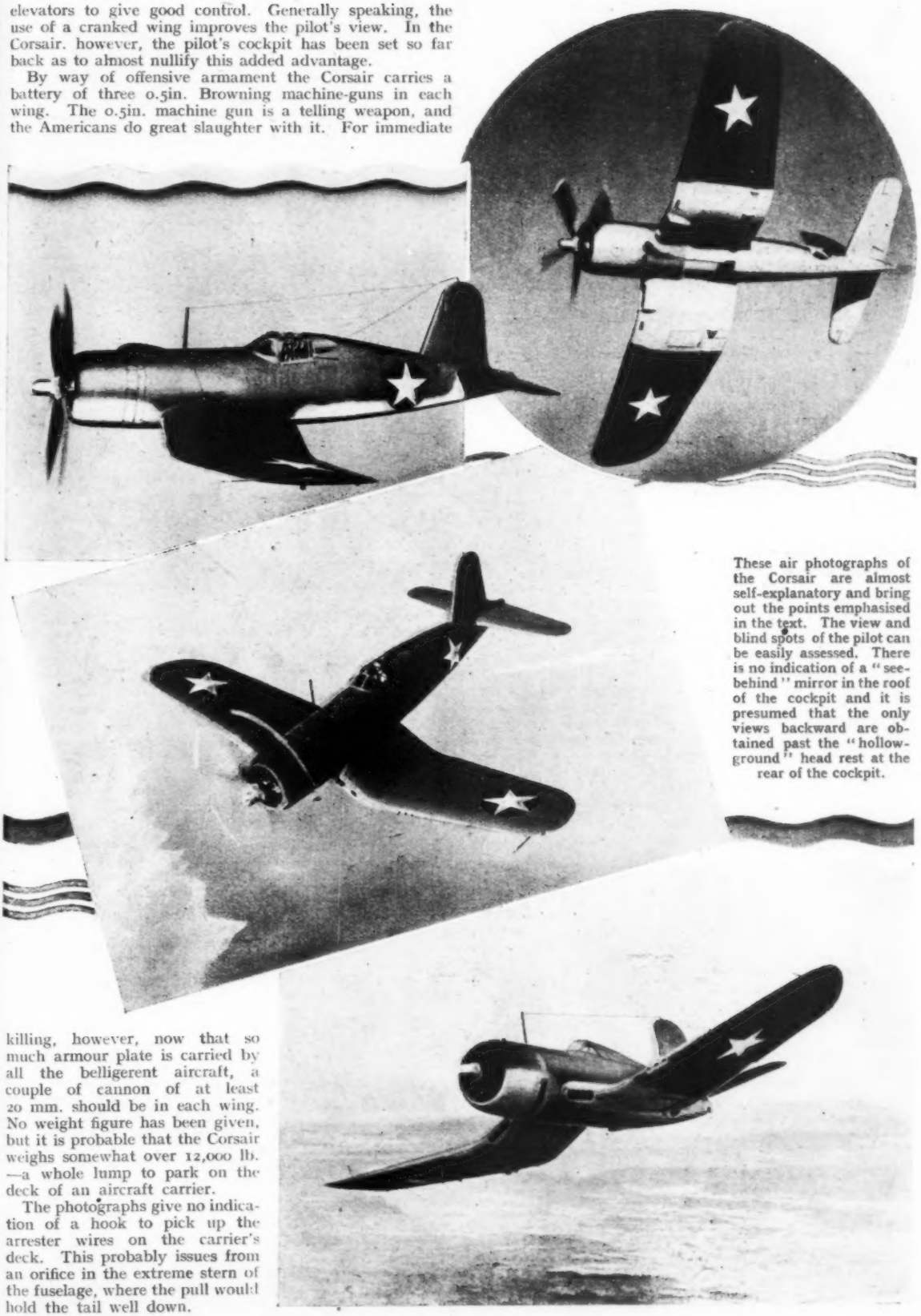
All three wheels retract—the main wheels being totally submerged within the wing section. As the wheel moves backward and upward it turns through 90 degrees, while the leg fairing rises on a plain hinge. Incidental to their use as fairings when the undercarriage is up, these leg covers must form effective air brakes when coming in to land. What happens to the airflow over the tail when the legs and lift flaps are down can only be guessed at, but considerable buffeting would be expected.

In the style now come to be almost universal, the fin and rudder are stepped well ahead of the tailplane and

elevators to give good control. Generally speaking, the use of a cranked wing improves the pilot's view. In the Corsair, however, the pilot's cockpit has been set so far back as to almost nullify this added advantage.

By way of offensive armament the Corsair carries a battery of three 0.5in. Browning machine-guns in each wing. The 0.5in. machine gun is a telling weapon, and the Americans do great slaughter with it. For immediate killing, however, now that so much armour plate is carried by all the belligerent aircraft, a couple of cannon of at least 20 mm. should be in each wing. No weight figure has been given, but it is probable that the Corsair weighs somewhat over 12,000 lb.—a whole lump to park on the deck of an aircraft carrier.

The photographs give no indication of a hook to pick up the arrester wires on the carrier's deck. This probably issues from an orifice in the extreme stern of the fuselage, where the pull would hold the tail well down.



These air photographs of the Corsair are almost self-explanatory and bring out the points emphasised in the text. The view and blind spots of the pilot can be easily assessed. There is no indication of a "see-behind" mirror in the roof of the cockpit and it is presumed that the only views backward are obtained past the "hollow-ground" head rest at the rear of the cockpit.

A Fighter Mosquito Squadron

Offence, Not Defence, the Watchword

By MAJOR F. A. de V. ROBERTSON, V.D.

IT is only recently that official mention has been made of the existence of the fighter brand of Mosquito, and it will probably surprise many readers to learn that at least one squadron has been equipped with this type for about a year past. Yet that is the case with a certain squadron which I was recently privileged to visit.

The twin-engined fighter has a definite place in the scheme of Britain's outfit for war. The single-engined fighter is designed purely for defence, and had France not collapsed in such an unpredictable manner our Spitfires and Hurricanes would never have been used for anything except defence of Britain and for short-range escort of bombers. For this work the single-engined fighter is supreme and unrivalled, and twin-engined machines have no chance of disputing with it the mastery of the skies.

The twin-engined fighter has quite a different function to perform. It has a long range and, therefore, can be used to strike deep into the heart of the enemy's territory. It is essentially an aggressive class of aircraft, but it would not be wise to use it in circumstances where it would be likely to encounter the single-engined fighters of the enemy. The quarry which it always hopes to find is the bomber of the enemy when the latter is working in areas beyond the range of the Spitfire and Hurricane. In fact, it is essentially a bomber-killer. It is also suitable for attacks on ground targets and for intruder work by night over enemy landing grounds.

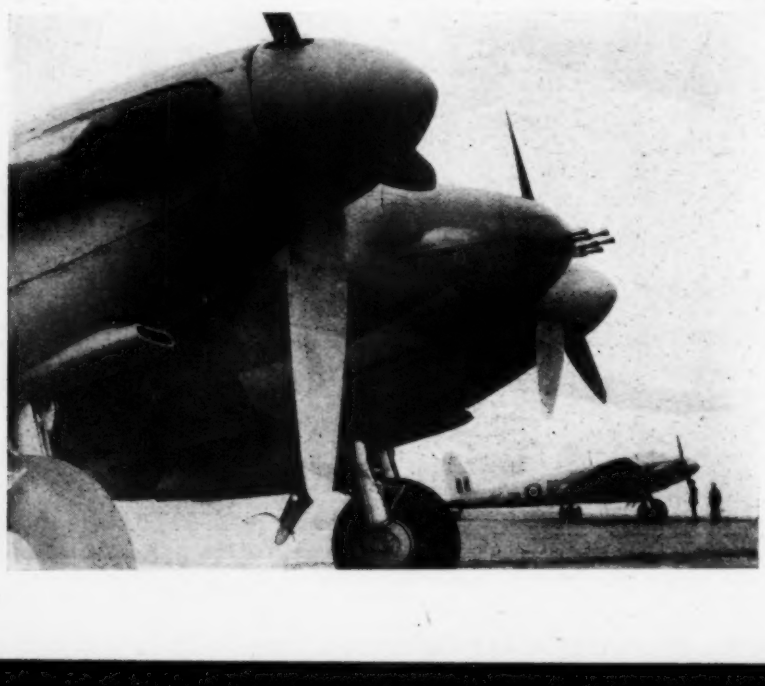
The squadron which I visited looks on the Bay of Biscay as perhaps its happiest hunting ground. There the bombers and flying boats of Coastal Command are continually prowling in search of U-boats from Lorient and St. Nazaire on their way out to harry Allied convoys in the Atlantic. Such a menace have they become to the Germans' favourite weapon of war that the enemy sends out well-armed aircraft to attack them, many of them being Ju 88s equipped for fighting. The British reply is to despatch long-range fighters, Mosquitoes and Beaufighters, to engage the Ju 88s, and in this work the squadron which I visited simply revels.

Wing Cdr. M. Constable Maxwell (top) and Flt. Lt. K. A. Quinton, who brought a Mosquito home 400 miles from the Bay of Biscay on one engine.

Most pilots are good navigators, but when flying for hours over the sea, and fighting whenever a chance occurs, a pilot has no time for accurate navigation. The second seat in the Mosquito is, therefore, occupied by a trained navigator. I had a long talk with one navigator who is the oldest member of the squadron. At the time of the Dunkerque evacuation this man was a sergeant air-gunner and won the D.F.M. Now he is a Flying Officer.

No Air Gunners

In the Mosquito the four 20 mm. cannon and the four 0.303 Brownings are all fired by the pilot, and the squadron has no use for air gunners, so my friend (if I may call him so) qualified as a navigator and now does what is probably the most intellectual work that any member of the R.A.F.



HITTING POWER: The 4 cannon and 4 machine guns in the nose of the fighter Mosquito. With the Beaufighter it makes the R.A.F. long-range fighters the most deadly of any Air Force.

A FIGHTER MOSQUITO SQUADRON

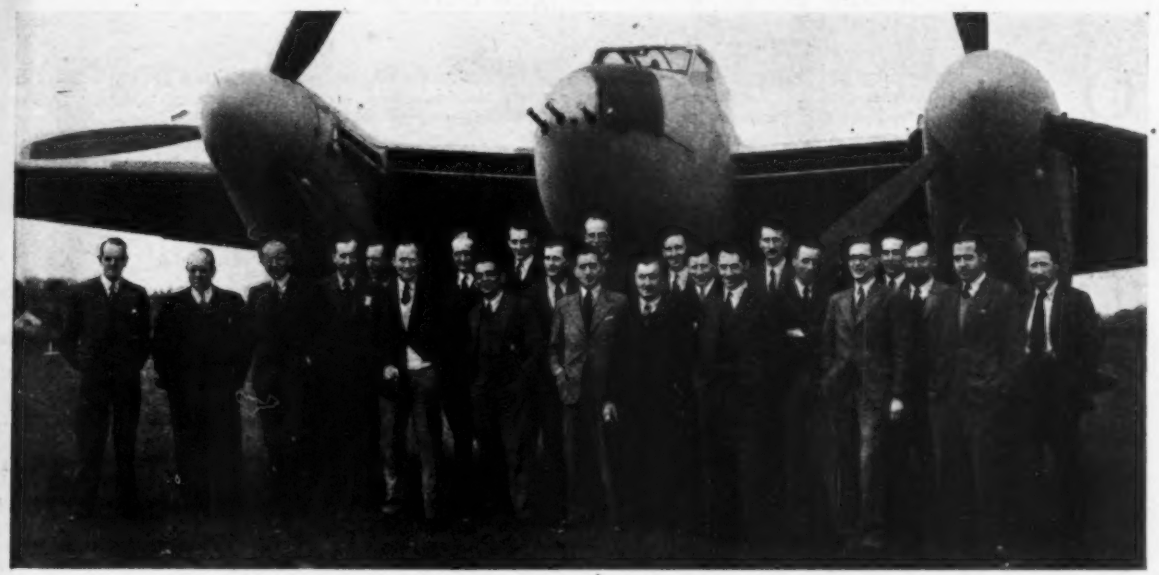
has to do. He admitted that when his machine got into a scrap he felt his fingers itching to fire the guns, but I hold that a man who has won the D.F.M. as a gunner and then qualified as a navigator has a record as creditable as anyone could possibly desire.

This squadron put up a tremendous show in its Defiants, and in one day it shot down 37 enemy aircraft in two patrols, without loss to itself. By now its total of confirmed victories is 92, and it hopes to notch its century before long.

The long-range work of the Mosquitoes naturally provides fewer targets than the Defiants were able to find, but the squadron has bagged a few over the Bay of Biscay, and who knows but that those victories set free some Sunderland or Liberator to bomb a U-boat, and so, perhaps, saved a valuable cargo ship. In the last three or four months this squadron has carried out 55 patrols over the Bay, and in addition has made about 60 intrusions by day and night over territory occupied by the enemy. On night intrusions the squadron has destroyed 15 enemy aircraft. During these forays it has also shot up and damaged 43 locomotives, two ships, ten power stations, and various other targets of less importance. The Germans have not yet devised a Mosquito-net!

I asked one pilot if, when attacking a train, he gave the engine-driver and fireman time to escape, as they might be Frenchmen. He said he did the first time, but it also gave the German *flak* crews time to man their guns, and when he came round again he was fired at. But he said that the drivers usually stop the trains very quickly, and probably manage to get off in time.

Of the Mosquito itself and its Merlin engine much has been written already in *Flight*, so no further description need be given here. It is of interest, however, to know that the squadron is devoted to the machine and is loud in praise of it. It is sweet to fly, say the pilots, and very strong. The wooden construction stands up well, even to a belly landing with wheels retracted. I asked about the effect of bullets on the wood and was told that it showed no tendency to splinter. The results of strikes by enemy fire are much the same as on a machine of metal construction. As for the power of the engines, I was shown one Mosquito in which the C.O. of the squadron had flown home 400 miles on one engine with the other out of action. No one could ask much more than that from any twin-engined aircraft.



ENTOMOLOGISTS : The de Havilland team of "back room boys" responsible for the Mosquito. (Left to right) : R. E. Bishop (Chief Designer) : F. W. Plumb (Superintendent of the Experimental Shop) ; W. A. Tamblin ; P. F. Bryan (Chief Draughtsman) ; R. M. Clarkson (Assistant Chief Engineer) ; D. King ; J. K. Crowe ; G. W. Drury ; C. T. Wilkins (Assistant Chief Designer) ; R. Hutchinson ; C. F. Wills ; Rex King ; R. H. Harper (Chief of Stress Office) ; D. R. Newman ; F. T. Watts ; R. M. Hare ; M. Herrod-Hempsall ; F. J. Hamilton ; J. P. Smith ; E. H. King ; R. J. Nixon ; A. G. Peters ; G. C. I. Gardiner. Messrs. A. W. Fawcett, J. E. Walker and C. C. Jackson were absent.

NEW FAST ATLANTIC CROSSING

IT was announced recently that a number of fast flights had been made between Canada and Britain by aircraft of the Royal Air Force Transport Command.

Favoured by exceptionally good conditions, Capt. G. R. ("Sam") Buxton, of British Overseas Airways Corporation, on the Atlantic return ferry service which is operated to the requirements of the R.A.F. Transport Command, has now improved on the previous best flying performances.

In a fully laden Liberator bomber from Newfoundland to Britain (2,200 statute miles) his take-off to landing time is reported to have been 7 hours 16 minutes—24 minutes less than the best similar flight of the kind by Captain W. S. May announced a few days ago, and 45 minutes less than what had stood until then for 14 months as the fastest Atlantic crossing. His coast-to-coast time was 6 hours 12 minutes, eight minutes less than the flight of Captain May.

Captain Buxton's voyage to Britain began at Montreal (3,150 statute miles). He flew in 3 hours 56 minutes to Newfoundland (950 miles), where he made a brief halt to set down passengers. His total actual flying time from Montreal to Britain was, therefore, 11 hours 12 minutes—1 hour 9 minutes better than the previous best elapsed-time flight via Newfoundland, and 38 minutes better than one via Nova Scotia, both accomplished in the previous two weeks by Captain S. W. A. Scott. Captain Buxton's average "ground speed" over the ocean was over 300 m.p.h., and he flew mostly at an altitude of 21,000 feet in an average air temperature of 43 degrees of frost.

Captain Buxton is 37 and joined Imperial Airways in 1928. Most of his peacetime flying was on Imperial Airways European routes and on the Britain to India service. He has been serving with the Atlantic air ferry for 27 months.

Sea Hurricanes, Martlets and Albacores on the flight deck of one of our carriers.

Sea Fighter Air Cover

Only One Aircraft Carrier Sunk by Bombs : Success of Carrier-borne Fighters : A Fallacy Exposed

By B. J. HURREN

ONE of the outstanding paradoxes of the war is the success of the aircraft carrier. Amateur strategists, more confident than their professional brethren, predicted that so large a target would surely be an easy victim to bomb attack; but the lesson of the war (which is the only lesson worth considering) is that British carriers have withstood bombing and engaged in devastatingly successful operations against the enemy.

Carriers have been lost mainly by submarine attack. Excluding the small carrier *Hermes*, no British carrier has to date succumbed to bombing.

Immunity of the carrier against air attack springs directly from the quality of the fighter aircraft borne in her. From the Sea Gladiators with which the war opened, in very limited numbers, we have now progressed to Seafires, fastest and most formidably armed fighter over all the oceans.

During the years of transition, Fleet Air Arm fighters have shot down and damaged more than 400 enemy first-line aircraft, many more than half of these being seen to crash.

With the advent of the Seafire, the defensive strength of the carrier has soared. The explanation of this is not so much that the Seafire can do more than its predecessors —the Fulmar and Sea Hurricane—but that it can get to what may be called the critical cone of bombing quicker and consequently put the enemy off his aim.

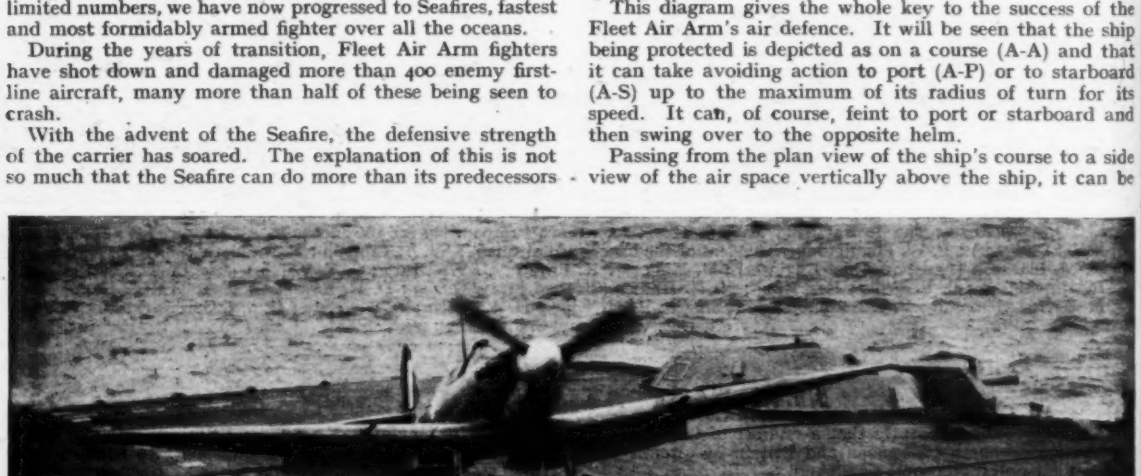
For it must be remembered that in protection of ships the number of enemy aircraft shot down is by no means the real tally of success. Many a tempting target has had to be left in order that the essential positioning for defence could be steadfastly maintained.

The Key to Success

The function of the sea fighter in giving air cover to surface craft can be seen in the diagram on the next page (a brave effort at presentation of four-dimensional factors in two dimensions!).

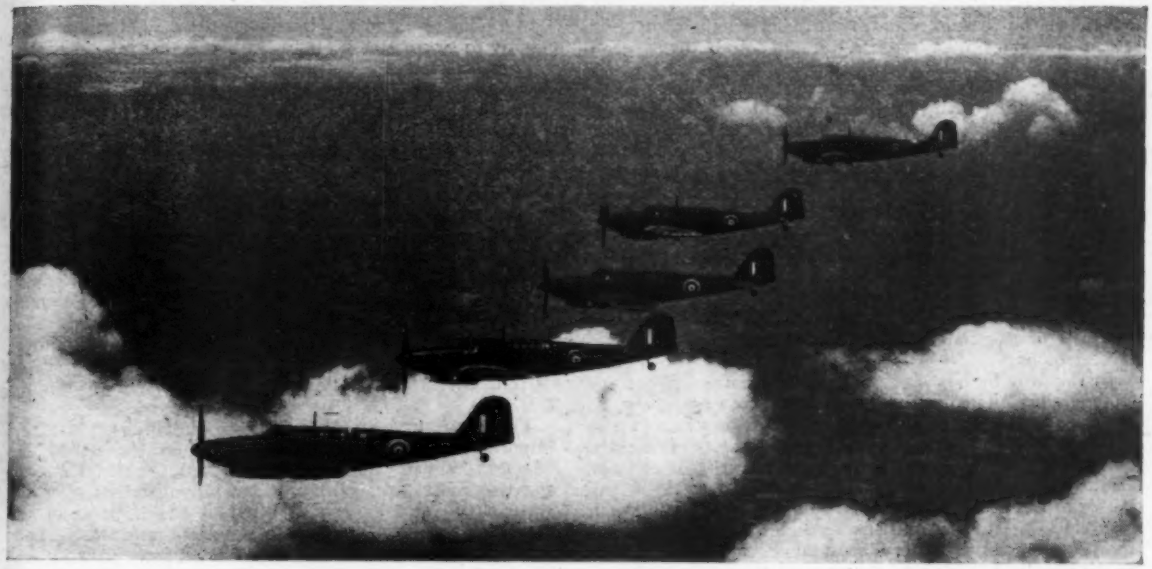
This diagram gives the whole key to the success of the Fleet Air Arm's air defence. It will be seen that the ship being protected is depicted as on a course (A-A) and that it can take avoiding action to port (A-P) or to starboard (A-S) up to the maximum of its radius of turn for its speed. It can, of course, feint to port or starboard and then swing over to the opposite helm.

Passing from the plan view of the ship's course to a side view of the air space vertically above the ship, it can be



A Seafire about to pick up the arrester wires as it alights over the aft round-down. Just behind the Seafire can be seen the square lift which takes the aircraft to and from the hangar deck.

SEA FIGHTER AIR COVER



A formation of five Fairey Fulmar 8-gun fighters. Although the Fulmar had equal hitting power with the early Spitfires and Hurricanes, it had insufficient performance to intercept modern bombers.

imagined that a cone is projected, inverted, with its point at the ship. The angle which the sides of this cone makes with a vertical line from the ship is governed by the flight trajectory of a bomb.

Now, it is obvious that to hit the ship with a bomb, release must take place somewhere on the perimeter of that cone. If the attacking aircraft, approaching from whatever direction, comes "inside" the cone—at whatever height—the bomb will fall *over*. Conversely, if it keeps "outside" the bomb will fall *short*.

The Fourth Dimension

This cone cannot be effective for an indefinite projection upwards, for the simple reason that the *time* taken by the bomb to fall (the fourth dimensional factor) is of vital importance since the ship on the move can, and most probably will, alter course during the falling time of the bomb. Thus the bomber who approaches too high has very little chance of success if the ship's look-outs keep keen watch.

On the other hand, if the attacker comes too low he must face a really formidable concentration of fire from the ship's multiple firing weapons, expressly designed for his discomfort.

There thus remains a middle truncated cone which is the optimum zone for bombing, and it is in this zone that the fighter aircraft must provide the necessary protection. Here it is that the Seafires, world's fastest carrier-borne fighters over the sea, are in their element, for manifestly with advance knowledge of the altitude of that defence zone their engines can be adjusted so as to give their best performance at that height.

Now this raises one of the war's best canards. Coroneted heads have uttered such nonsense on this score, and the uninitiated have drunk so deep of the bubbling mead of ignorance, that it has become a firm belief that sea fighters must of necessity be inferior in performance to land fighters.

Nothing could be farther from the truth. There are two important aspects to this side of the question of the efficiency of carrier-borne fighters.

First consider the extra equipment required to adapt any fighter from land to carrier operation. The two main items which can be discussed here are fitting of arrester gear equipment and of catapult spools.

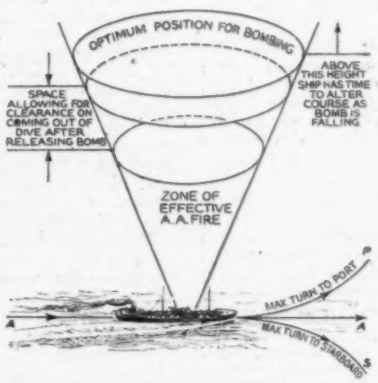
It cannot be too emphatically stated, with full technical knowledge, that these minor items, enlarged by gossips to major issues, scarcely affect the performance at all at cruising speeds, but in the higher operational fighting speeds they do cause a slight reduction. As, however, these operational speeds are far in excess of the maximum speeds of bombers and torpedo-bombers used to attack ships, the question is irrelevant *except* where the enemy can provide fighter cover for his attackers.

This raises the second aspect: Can the carrier fighter be considered the equivalent of or better than the land fighter?

The large community suffering from sea fever will unhesitatingly assert that the land fighter must always be superior. But the fever-struck are wrong. Provided the carrier keeps its distance from land bases, as it almost invariably does, then the sea fighter can be considered actually superior, or at worst equal, to the land fighter. For in order to reach the carrier (while it is escorting the bombers) the land fighter must carry fuel to fly, say, 200 miles at a minimum out to sea and 200 miles back after combat.

This extra loading of fuel more than outweighs the extra equipment involved in equipping a landplane for deck operation.

England's life-blood is on the sea. The convoys must come through, to bring us food, and must go out to enable us to wage the war. By the


OPTIMUM POSITION FOR BOMBING
ABOVE THIS HEIGHT SHIP HAS TIME TO ALTER COURSE AS BOMB IS FALLING
SPACE ALLOWING FOR CLEARANCE ON COMING OUT OF DIVE AFTER RELEASING BOMB
ZONE OF EFFECTIVE A.A. FIRE
MAX TURN TO PORT
MAX TURN TO STARBOARD
A
A

The imaginary cone above a ship showing how an attacking bomber is forced to use a restricted space. It is in the truncated cone that the fighters must provide protection.

SEA FIGHTER AIR COVER

advent of the Seafire, convoys can be given the protection of the best sea fighter in the world and by far the superior weapon *on the spot*.

Evidence to this effect is accumulating swiftly. The successes of the convoys to Russia and through the Western and Eastern Mediterranean have been spectacular. One might say, looking at the possible sites for enemy bombing squadrons, that it would seem impossible for ships to face their attack; and the core of the defence and root of frustration of the enemy has been the carrier-borne fighter.

Jerry's particular headache at the moment is how to beat these fighters, now more and more going into battle in replacement of the earlier equipment, which was admittedly inferior to the Ju 88 fighter-bomber, for example. And his present tactics are to try to swamp the defences of the convoy by synchronising high- and low-level attacks.

In this way he hopes to evade the air parasol above the convoy since, with perfectly regular Teuton reasoning, he has argued that no fighter pilot will dare to descend into the hailstorm of shrapnel, shells and bullets which the escort and convoy ships put up against low-flying attacks.

But in this he has again under-valued the reckless gallantry of the Fleet Air Arm's fighter pilots in braving their own side's fire in order to ensure a kill. It may be worth recalling some of the facts concerning recent convoy actions in which these fighter pilots more than tweaked Hitler's moustache and prodded Goering right on the 500th medal.

In a non-stop, four-day battle against a highly important convoy to North Russia, between September 9th and 15th, 1942, the air score against the enemy was 40 aircraft shot down and a large number of aircraft damaged for the loss of no more than four naval fighter aircraft. These odds of plus 10:1 in our favour are by no means—to coin a phrase—a flash in the gun—that would be impossible if you could see the full operational reports over the four-days' battle. They represent a cast-iron tally of victory of naval fighters against hosts of attackers. The convoy went through.

Similar in the way of success for the Fleet Air Arm, but dissimilar in that the odds were initially (and on paper) far higher in favour of the enemy, the result of an equally important Malta convoy last year may be quoted. Net result of this sustained action was that Fleet Air Arm fighters shot down 66 enemy aircraft against a total loss of eight aircraft, the pilots of four of which were rescued safely.

These are undeniable results of the highest strategic importance. One must look to those causes for far-reaching effects. Whilst Captain Sertorius and General Dietrich, the two most prominent military propagandists over the water, have not expressly stated as much, it is of the utmost importance that since these actions (and other actions which it is not desirable to quote here) have taken place, the German High Command has sacked its naval C.-in-C. and in his place put a submarine fanatic.

Technical Training

Need for a University of Aeronautics

ON numerous occasions in the past *Flight*, as well as its associated journal *Aircraft Production*, has urged the need for first-rate facilities for advanced technical training in aeronautics The following letter was published in the *Daily Telegraph* on Friday, May 7th, and a brief note in a leading article in that journal on the same day directed attention to it:

The dearth of facilities available to aspirants for technical positions in aircraft engineering and for specialised technical education in the science of aeronautics is a matter for regret.

Much good work has already been done in a prescribed form by the Royal Aeronautical Society, which body, incidentally, was instrumental in inducing the Senate of the University of London to create a B.Sc. (Aeronautics) degree of that university, now in abeyance, alas, due to the outbreak of war. Up to that time it was the only academic degree open to aeronautical students in this country.

One of our foremost aircraft designers, Mr. F. G. Miles, has drawn attention to this serious educational deficiency and advocated the creation of a University of Aeronautics. Again, Sir Roy Fedden, on his return from the U.S.A. with the British Technical Mission, made a strong appeal for improved technical education and research facilities as a result of observation of immense progress being made in America. Already, Sir Patrick Dollan, in an address to the students of Glasgow University, has suggested that a chair of aviation should be established in that university.

To establish a chair of aeronautics at different universities is excellent in itself, but, I submit, does not go far enough. A good case can be put forward for the immediate establishment and Government endowment of a British University of Aeronautics for the advanced training of aeronautical engineers.

A national institution is the obvious solution, and its equipment would need to be lavish and of the most modern type. Not only aerodynamics but power plant, metallurgical and production techniques would form part of its curriculum and, almost needless to say, it should possess the most complete library of aeronautical works and maintain wide and modern research facilities. The object would be to bring under one roof all the sciences and branches of engineering and technology directly or indirectly connected with aircraft problems.

Only by such means can the vast number of qualified technicians needed in one of the most promising fields of specialised engineering be forthcoming. National prosperity and the future well-being of this country and its Empire overseas are bound up with the efficiency and quality of the aircraft for transport purposes we produce after the war.

One sincerely hopes the suggestion will be judged in the light of its important bearing upon Britain's future position in the era of air transport.—Yours faithfully,

GEOFFREY SMITH,
Dorset House, S.E.1. Managing Editor, *Flight*.

Daily Telegraph comment was:—

The Air Age

It is by now common ground among all forward-looking men that in the coming era the air will revolutionise the arts of peace as drastically as it has already revolutionised the art of war. No nation qualified by numbers, influence and the capacity of its people to share in the leadership of mankind will be able to assert its title unless it occupies a foremost place in all that relates to the development of aviation. Britain, if she is to retain in the peace the primacy which in common with her two principal Allies she has gained in the war, will need not only organisation, equipment, machines, airfields and a great aircraft industry, but extensive facilities for training and research in all branches of aeronautics. It is the technicians who will make the pace and the schools which will make the technicians.

A letter on this urgent question which appears in an adjacent column directs attention to the almost total lack of educational facilities and recommends that the science of aeronautics be represented not merely by chairs at various universities (of which the only one so far established is in abeyance), but by a university of its own. Some plan of the kind merits earnest consideration and should be laid concurrently with other preparations for post-war civil aviation. The United States is at the moment as much ahead of us in this as in all other departments concerned with the development of air transport. No political agreements will avail us to make up the leeway unless we are ready and able to hold our own when the time comes. If the foundation is not laid now it may presently prove too late to lay it at all.

CORRESPONDENCE

The Editor does not hold himself responsible for the views expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

THE C. W. 21-B
Forerunner of the Mohawk

IN your issue of April 29th, R. E. Gregory asked for details of the C.W. 21B. According to my information it is a single-seat radial-engined fighter which preceded the Mohawk and is in service with Netherlands Indies Air Force.

It is the machine which W. Firth, in the April 8th issue, described as the best interceptor. Surely an aircraft which was the forerunner of the Mohawk to Kittyhawk series cannot beat the Spitfire or Typhoon.

R. PEARCE.

VENTURA'S METIER
Not at Its Best as a "Day-bomber"

I, TOO, fail to understand the repeated use of the Ventura as a day bomber, when we have at least one type that seems to do the job better.

I refer to the Mosquito, and I am sure most people will agree that this outstanding aircraft can outstrip the 300 m.p.h. odd of the Ventura. Of course, we know no official figures of the Mosquito's behaviour under various conditions, but we have only to look at the clean shape—remember it carries two R.-R. Merlins—to realise that its performance must be really good. The bomb loads are almost identical.

Surely, the Ventura would be better employed with Coastal Command, where its famous predecessor was so successful?

ROY T. SMITH.

FAULTY FILMS
What the Flying Tigers Achieved

I HAVE followed with interest the talk of faulty films which goes on in the Correspondence columns, and would like to add a little more to it.

The film to which I refer is "Flying Tigers," and the two points are these.

First, in one of the dog-fights against Nakajima fighters, a peculiar change takes place. The pilots take off in Tomahawks, and the actual fight takes place with the Americans flying Spitfires. When the American aircraft land they are again Tomahawks.

Secondly, while the blowing up of a Japanese bridge is in progress the squadron commander bales out—well inside Japanese territory. Yet when he is next seen he is back on the airfield looking as if he arrived back with absolute ease.

I understood these films were to show the general public the horrors of aerial warfare in China; but if these mistakes are continuously made the public will be going just for a laugh.

R. E. GREGORY.

"PASSENGER DRAG"
An Apparent Anomaly

READING through an American magazine recently I came across an article describing a towed flight of two gliders on a long cross-country trip in the United States. The tug was a Waco biplane, and the gliders were of the clean, high-performance type. In the course of the article the following sentence occurred, which rather puzzled me:

> "The weight of an additional passenger in the towplane (tug) was felt far more sharply in reduced speed and performance than when the same passenger was carried in a glider. It's just about the difference between lifting 200 pounds and pulling the same weight behind you in a wagon."

Perhaps I am dense, but why should it make any difference in which part of the air "train" the passenger sat?

"R.H.O."

[The explanation is quite simple. At the cruising speed of the air "train" the L/D (ratio of lift to drag) of the Waco biplane was probably in the neighbourhood of 6:1. The glider, if of clean design, probably had an L/D of 18, or three times as good. In other words, for every 6 lb. of load added to the tug there would be 1 lb. of extra drag. For every 6 lb. added to the glider the additional drag would only be $\frac{6}{18}$ lb., or one-third, in direct proportion to the L/D of the two aircraft.—ED.]

T.V. DIVES
Are They Possible Nowadays?

THE sub-title of the article "Aileron Control" by "Witness" in *Flight* of April 22nd contains the expression "Terminal Velocity Dives the Real Test." Am I right in thinking that such dives could not be made in modern aircraft, owing to the high speeds that would be attained and the great heights at which the dives would have to start if the pilot were to have a chance of pulling out of the dives without breaking his wings?

"PER ASTRA AD MARE."

[Our correspondent is perfectly right in pointing out that terminal-velocity dives are not demanded of modern aircraft types, which are so "clean" that the speeds reached would be excessive. The sub-editor, in the hurry of going to press with an issue that had to be rushed on account of the printers' Easter break, thought of terminal-velocity dives from a habit formed in the old biplane days. "Witness" must be absolved from all blame. Modern aircraft types are only expected to reach what is termed a "limiting speed," which is determined for each type by considerations of structural strength (and perhaps the pilot's ear drums!). This limiting speed varies, of course, with the different types, but in general it may be said to be somewhere in the region of 300-360 m.p.h. for bombers and 500 m.p.h. or more for fighters.—ED.]

IN DEFENCE OF THE DEFIANT
Its Origin and Intended Function

MAY I refer to recent articles and correspondence concerning the utility of, and origin of, the Defiant aircraft so as to correct one or two misapprehensions which may have arisen.

The Defiant was conceived in 1935 in my office at A. and A.E.E. in collaboration with the chief designer and chief test pilot of Boulton and Paul, Ltd. It subsequently became an Air Ministry specification.

The advent of powered turrets was the basis of its design, and it was intended entirely as a home defence day fighter against bomber formations. It was visualised that it would be used in conjunction with single-seater fighters such as the Hurricane, the performance of which it nearly approached. It was recognised that being heavier its rate of climb would be slower than that of the fixed-gun fighter, but it was foreseen that the Hurricanes would first engage the enemy in quarter and astern attacks and when the enemy were so committed, the Defiants would join combat, using their turret guns from beam positions, the word "beam" including positions below the bomber as well as on either flank. By this means it was considered that overwhelming fire could be brought to bear on bomber formations, particularly against the leader, who was fairly well protected from single-seater fighters by the rest of the formation, but on whom the cohesion of the formation relied. Furthermore, with attacking Defiants on each flank the bombers would have restricted evasive manœuvre.

The Defiant was, of intention, not equipped with pilots' guns, as it was considered that their presence would incline pilots to consider them as offensive armament and regard the turret as purely for defence, an attitude which was known to prevail with the Bristol fighter in the last war and which had an adverse effect upon its tactical use.

The Defiant was not intended for fighter-v-fighter engagements, although, of course, such combats might be forced upon it.

Unfortunately, the Defiant was never used as visualised for reasons which cannot be given in this letter, and therefore its true value could not be judged. This in no way detracts from the excellent work it did outside its intended rôle at Dunkirk nor as a night home defence fighter for which duties it was admirably suited.

Every Defiant crew whom I know are loud in its praise, and regret they were not given an opportunity to prove its utility in its intended rôle.

The Defiant was to have been followed by a twin-engine model having an outstanding performance and an overwhelming turret installation, but for reasons which also cannot be stated at this juncture, it did not see the light of day.

E. D. DAVIS, Air Vice-Marshal.

SERVICE AVIATION

The long-range day-fighter version of the D.H. 98 or Mosquito. Despite its undoubted efficiency as a weapon of war the Mosquito has exquisite "lines."

Royal Air Force and Fleet Air Arm News and Announcements

Royal Appointment

AIR CHIEF MARSHAL SIR EDGAR R. LUDLOW-HEWITT, Inspector-General of the R.A.F., has been appointed Principal Air Aide-de-Camp to the King, in succession to Air Chief Marshal Sir Hugh Dowding, who has retired.

Lt. Gen. F. M. Andrews

LT GEN. FRANK MAXWELL ANDREWS, the U.S. Commanding General in the European Theatre of Operations, whose death in an air accident in Iceland was recently announced, was appointed to this command in February last, in succession to Gen. Eisenhower.

He commanded the U.S. Army Air Force from 1935 until 1939 and was a strong advocate of the heavy bomber for strategic bombing. Indeed it is reported that the Flying Fortresses were developed largely as a result of his urging the advantages of the big four-engined type. He was also a staunch believer in close air support for ground troops and, before coming to Britain, commanded the U.S. Army Air Force, which contributed towards the invaluable air support given to the victorious Eighth Army in the Middle East.

Promotions

General Duties Branch.

Air Vice-Marshal R. S. SORLEY, C.B., O.B.E., D.S.C., D.F.C., to be Acting Air Marshal. April 20th, 1943.

Air Comdre. R. L. G. MARIX, C.B., D.S.O., to be Acting Air Vice-Marshal. April 11th, 1943.

Awards

Far East

THE KING has been graciously pleased to approve the following awards to members of the Royal Australian Air Force in recognition of gallantry displayed in flying operations against the enemy in the New Guinea area.

Distinguished Service Order

Wing Cdr. B. R. WALKER.

Distinguished Flying Cross

Sqn. Ldr. R. A. LITTLE.
Flt. Lt. R. F. UREN.
F/O. J. P. MAGUIRE
F/O. J. T. SANDFORD.
F/O. A. H. SPOONER.
P/O. C. A. CAMPBELL.

THE KING has been graciously pleased to approve the following awards in recognition of gallantry displayed in flying operations against the enemy:—

Distinguished Service Order

Wing Cdr. H. F. BURTON, D.F.C.—Wing Cdr. Burton is the C.O. of an exceptionally successful wing. Recently, he has taken part in several sorties, involving low level attacks on heavy armoured fighting vehicles.

Sqn. Ldr. D. WESTON-BURT, No. 6 Sqn.—This officer has led his squadron with great dash in recent low level attacks on the enemy's armoured fighting vehicles and mechanised transport. On one occasion intervention by his squadron prevented an attack on a French force.

Bar to Distinguished Flying Cross

Act. Sqn. Ldr. D. F. E. C. DEAN, D.F.C., No. 35 Sqn.—One night in February, 1943, this officer captained an aircraft detailed to attack St. Nazaire. Whilst crossing the Channel, on the outward flight, one of the port engines failed. Nevertheless, Sqn. Ldr. Dean continued his mission. Whilst over the target area his aircraft was held in searchlights and subjected to heavy fire from the ground defences. Despite this, he pressed home a vigorous attack. Shortly after the aircraft was headed for home, one of the starboard engines failed. Sqn. Ldr. Dean succeeded in maintaining height and eventually reached an airfield in this country where he effected a masterly landing in difficult circumstances.

Act. Flt. Lt. H. MALKIN, D.F.C., R.C.A.F., No. 35 Sqn.—One night in March, 1943, this officer captained an aircraft detailed to attack Berlin. Whilst over the city the bomber was held in searchlights and subjected to heavy anti-aircraft fire. The rudder controls were severed and one of the port engines was damaged, causing it to fail. Despite this, Flt. Lt. Malkin skilfully controlled the damaged aircraft and executed a successful attack. Soon after leaving the target area, efforts to re-start the damaged engine proved successful, but further trouble was encountered. The bomber was again engaged by anti-aircraft fire, which rendered the port outer engine unserviceable. The mid-upper gunner was wounded, while all lights in the cockpit failed. With extreme difficulty height was maintained and, displaying superb airmanship, Flt. Lt. Malkin flew the damaged bomber to an airfield in this country.

Wing Cdr. D. H. BURNSIDE, D.F.C., No. 427 (R.C.A.F.) Sqn.—One night in March, 1943, Wing Cdr. Burnside and P/O. Hayhurst were captain and bomb aimer of an aircraft detailed to attack Essen. When nearing the target area the bomber was hit by anti-aircraft fire. One of the crew was killed and another severely wounded, while the aircraft sustained damage. The aileron control was affected and the windscreen de-icing glycol tank burst, drenching P/O. Hayhurst and filling the forward part of the bomber with suffocating fumes. Despite this, P/O. Hayhurst directed his captain to the target, which was successfully bombed and a good photograph obtained. The aircraft was held by searchlights for a few minutes, but Wing Cdr. Burnside skilfully evaded the defences and set course for home. On the return flight the aircraft encountered enemy fighters, but each time he shook them off. Displaying fine airmanship he flew the damaged aircraft back to an airfield in this country.

Act. Sqn. Ldr. F. D. HUGHES, D.F.C. R.A.F.V.R., No. 600 Sqn.—As pilot and observer respectively, Sqn. Ldr. Hughes and F/O. Dixon have flown together on many night sorties in operations in North Africa. During these flights they have destroyed three enemy aircraft.

Distinguished Flying Cross

P/O. R. J. HAYHURST, No. 427 (R.C.A.F.) Sqn.—For citation see Wing Cdr. Burnside, D.F.C.

F/O. L. DIXON, R.A.F.V.R., No. 600 Sqn.—For citation see Act. Sqn. Ldr. Hughes, D.F.C.

Group Capt. E. H. FIELDEN, M.V.O., A.F.C.—This officer has flown on various operational missions, some of which were of a most hazardous nature. He has displayed a high standard of operational efficiency, setting an example which has contributed materially to the high morale of the air crews under his command.

Act. Sqn. Ldr. E. G. GILMORE, R.C.A.F., No. 408 (R.C.A.F.) Sqn.—One night in February, 1943, Sqn. Ldr. Gilmore and Sgt. Smith were captain and bomb aimer respectively of an aircraft detailed to attack Cologne. Whilst over the target area the aircraft was subjected to

Wing Cdr. Hugh Gordon Malcolm, late O.C. No. 18 Light Bomber Squadron in N. Africa, who has been posthumously awarded the Victoria Cross. The official citation appeared in our issue of May 6th.

heavy anti-aircraft fire and sustained much damage. The aircraft went out of control and considerable height was lost before Sqn. Ldr. Gilmore regained control. The bomber was riddled by shell splinters and one of its propellers was shot away. Two compasses were rendered useless and all navigational charts were lost. Nevertheless, Sqn. Ldr. Gilmore flew the damaged bomber to an airfield near the coast, having received valuable assistance from Sgt. Smith, who, by use of the bomb sight compass, displayed skilful navigation.

Act. Flt. Lt. M. W. PETTIT, R.C.A.F., No. 218 Sqn.—This officer, who has completed twenty-seven operational missions, has displayed great keenness and tenacity. On two occasions towards the end of 1942, he displayed great resolution in pressing home his attacks on certain targets after his aircraft had been badly damaged by enemy action. In February, 1943, he took part in an attack on Cologne. Whilst over the city his aircraft was held in the searchlights and hit by anti-aircraft fire. One engine was put out of action and two windows beside the pilot were blown in. Despite this, Flt. Lt. Pettit successfully bombed his target.

Act. Flt. Lt. B. G. WALLACE, R.N.Z.A.F., No. 214 Sqn.—This officer has completed forty-one sorties, including a number of attacks against targets in the Ruhr. One night in March, 1943, he captained a bomber detailed to attack Munich. Although the undercarriage and tailplane of the aircraft were damaged by striking a tree when taking off, Flt. Lt. Wallace flew on and eventually accomplished his mission successfully. Three nights later he took part in an attack on Essen. Whilst over the target area his aircraft was held in the searchlights. Despite this, he pressed home his attack from 8,000 feet and dived to 1,000 feet to escape the defences. On the return flight he engaged a light anti-aircraft gun position and silenced it. Although his aircraft was hit in many places during the operation, he flew it safely to base.

P/O. D. F. ALLEN, R.C.A.F., No. 408 (R.C.A.F.) Sqn.—This officer has completed thirty sorties, involving attacks on a variety of well-defended targets in Germany and Northern France. On one occasion, when returning from Hamburg, his aircraft was badly damaged by enemy action, but he flew it back to base.

P/O. P. E. MITCHELL, R.A.F.V.R., No. 408 (R.C.A.F.) Sqn.—P/O. Mitchell is a navigator of high merit. He has taken part in twenty-three sorties, including a number of attacks on heavily defended targets in the Ruhr and Northern France. One night in March, 1943, he navigated an aircraft which attacked Berlin. His great skill contributed materially to the success achieved.

P/O. E. L. GIMBEL, P.C.A.F., No. 403 (R.C.A.F.) Sqn.—This officer has taken part in a very large number of sorties over enemy territory, including a number as escort to heavy bombers. P/O. Gimbel, who is an excellent section leader, has destroyed two enemy aircraft. In addition he has damaged four locomotives.

P/O. V. SMITH, R.A.F.V.R., No. 3 Sqn.—This officer has completed 29 sorties over enemy territory at night, often in adverse weather. During these operations he has attacked an anti-aircraft gun post, a railway station and buildings and a convoy of motor vehicles, raking them with machine gun fire.

Engine Failure Over Berlin

F/O. R. B. HOPE, R.A.F.V.R., No. 83 Sqn.—In March, 1943, F/O. Hope was captain of an aircraft detailed to attack Berlin. When about 40 miles from the target, one engine had to be switched off owing to overheating. Despite this and the fact that the rear turret was unserviceable, this officer pressed home his attack, and bombed his objective in the face of intense anti-aircraft fire and a considerable number of searchlights. On the return journey, whilst at 9,000 feet, the aircraft was held by searchlights once more and again subjected to very heavy fire, being forced down to 6,000 feet. Although the manœuvrability of the bomber was greatly hampered by the loss of one engine, F/O. Hope, by superb airmanship, was able to take successful evasive action and return safely to base.

F/O. J. A. HOPE, R.A.F.V.R., No. 196 Sqn.—F/O. Hope was captain and pilot of an aircraft which was detailed to attack Essen one night in March, 1943. While the target was still a distance of 200 miles away, the aircraft was involved in a collision and severely damaged, making any evasive action which might become necessary well nigh impossible. It was also found impracticable to climb much beyond 14,000 feet. Despite the serious handicaps, F/O. Hope, with grim determination, proceeded on his mission, which he successfully accomplished.

SERVICE AVIATION

Forced Down to 900 ft.

P/O. P. S. ISAACSON, D.F.M., R.A.A.F., No. 156 Sqn.—One night in March, 1943, this officer was detailed for an attack on Berlin. Following the attack and while still over the target area, this aircraft was hit by anti-aircraft fire and severely damaged. The mid-upper turret frame was twisted, the perspex and two engine cowlings blown off, the aileron controls damaged, and the aircraft forced down to 4,000 feet. On the return journey the aircraft was driven off the route and held in a cone of searchlights for 15 minutes; during this time a further loss of height down to 900 feet occurred. In the face of this perilous situation P/O. Isaacson, showing coolness, resolution and skilful airmanship, succeeded in flying his aircraft back to base.

P/O. W. S. SHERK, R.C.A.F., No. 419 (R.C.A.F.) Sqn.—P/O. Sherk, as captain of aircraft, was detailed to attack Cologne in February, 1943. When about 70 miles short of the target the port engine failed. This officer, with great determination, pressed on, however, and successfully completed his mission.

Act. Flt. Lt. W. W. BLESSING, R.A.A.F., No. 105 Sqn.—In March, 1943, this officer flew the leading aircraft of a bomber force detailed to undertake a low level attack on the railway workshops at Paderborn. The operation, involving a deep penetration into Germany in daylight, demanded a high degree of efficiency. That the sortie was executed exactly as planned and success achieved was largely attributable to Flt. Lt. Blessing's fine leadership and great skill. This officer has taken part in 17 sorties, all of them in daylight, and invariably displaying great determination and efficiency.

Act. Sqn. Ldr. R. M. PINKAM, No. 150 Sqn.—This officer has completed 56 sorties, during which he has attacked targets in Germany, Italy and Tunisia. He has at all times pressed home his mission with the utmost courage and determination and has obtained many excellent photographs.

Act. Flt. Lt. R. C. BUCHANAN (R.N.Z.A.F.).—Flt. Lt. Buchanan has flown on 37 long-range reconnaissance missions over enemy-occupied territory, including sorties to Rotterdam, Wilhelmshaven, Cologne, Essen, Bremen and objectives in Norway and Tunisia. On one occasion he descended in very bad weather to within a hundred feet to obtain photographs.

F/O. R. I. L. CHISHOLM, R.A.F.V.R., No. 142 Sqn.—This officer is a gallant and determined captain of aircraft. One day in August, 1942, while flying on an anti-submarine patrol in the Bay of Biscay, his aircraft was attacked by a Ju 88. F/O. Chisholm inflicted considerable damage on the attacker, and drove it off. In October, 1942, he was detailed to bomb Kiel, and whilst over the target area was attacked by a Fw 190. F/O. Chisholm displayed masterly evasive tactics, which enabled him to avoid the enemy and complete his mission.

F/O. J. ETCHELLS, R.A.F.V.R., No. 142 Sqn.—As captain of aircraft, F/O. Etchells has consistently shown skill and determination, pressing home his attacks from a low level regardless of the heaviest ground defences. In October, 1942, this officer was detailed to take part in an attack on Cologne. He persisted in his task in the face of intense opposition, and successfully bombed the target, afterwards flying his aircraft safely back to base, although one engine was badly damaged.

F/O. D. H. GREAVES, R.A.F.V.R., and W/O. F. M. ROBBINS, both of No. 255 Sqn.—In operations in North Africa F/O. Greaves and W/O. Robbins have flown together as pilot and observer of aircraft respectively. They have co-operated in the destruction of five enemy aircraft. In one combat F/O. Greaves opened fire from extremely close range, causing the enemy aircraft to explode and disintegrate in the air. The outside of his own aircraft was smothered in oil, blown from the enemy's tanks by the force of the explosion, making it impossible to see through the windscreen. In spite of this, F/O. Greaves flew the aircraft to an airfield, where he succeeded in cleaning the windscreen sufficiently to enable him to effect a landing.

P/O. W. O. RUBLEE, R.C.A.F., No. 150 Sqn.—P/O. Rublee has completed 54 operational sorties against targets in Germany, Italy and Tunisia, always pressing home his attacks with great determination. On one occasion when over Sicily his aircraft was repeatedly hit. A petrol tank caught fire, and the hydraulic system was put out of action. After the fire had been extinguished, P/O. Rublee flew the aircraft back to base, and made a successful crash landing.

Transport Destroyer

Act. Sqn. Ldr. S. P. RUSSELL, R.A.F.V.R., No. 23 Sqn.—This officer has completed 41 sorties. Whilst serving in the United Kingdom, he participated in numerous attacks on lines of communication in France and Belgium, causing the destruction of seven locomotives. In the Middle East he has executed many sorties, involving attacks on rail and road transport, causing much destruction. In March, 1943, Sqn. Ldr. Russell made a successful attack on a destroyer. Some days later he pressed home a vigorous attack on a medium-sized merchant vessel, setting it on fire. In addition he destroyed an E-boat.

Act. Flt. Lt. A. E. MORRISON-BELL, R.A.F.V.R., No. 6 Sqn.—This officer has participated in 12 low level attacks on armoured fighting vehicles. In March, 1943, he led a formation of aircraft on a concentration of tanks near El Hamma. In spite of heavy anti-aircraft fire, a vigorous attack was pressed home, several tanks being put out of action.

F/O. D. W. JONES, R.A.F.V.R., No. 6 Sqn.—In attacks on the enemy's mechanised transport, this officer has displayed great courage and determination. In March, 1943, he took part in an attack on a number of enemy tanks south of El Hamma. Despite intense and accurate anti-aircraft fire, F/O. Jones pressed home his attack, setting two tanks on fire. His aircraft was severely damaged, but he skilfully fought off two enemy fighters to make a successful landing in our own lines.

F/O. D. S. LEE, R.A.F.V.R., No. 6 Sqn.—In operations in the Western Desert, this officer has completed ten low flying attacks on enemy mechanised transport. More recently, in Tunisia, he has taken part in several sorties of a similar nature. In an operation in March, 1943, he attacked a tank from such close range that his aircraft was damaged by the blast and flying metal when the vehicle blew up. The following day, on another sortie, he brought his aircraft so low to destroy a tank that he damaged a propeller and the tail wheel by hitting the tank as he broke away.

F/O. T. I. PETERSEN, R.A.F.V.R., No. 6 Sqn.—This officer has taken part in eleven sorties, involving attacks on tank concentrations. On two occasions his aircraft has been severely damaged by enemy fire, but, displaying great skill, F/O. Petersen, on each occasion, succeeded in landing in our own lines.

Conspicuous Gallantry Medal (Flying)

Flt. Sgt. (now P/O.) C. C. CORDER, No. 248 Sqn.—This airman has participated in 71 operational missions, including sorties off the Norwegian coast, over the Mediterranean and over the Bay of Biscay. He has displayed great navigational skill and perfect teamwork, which have made him a valuable member of aircraft crew. On one occasion, in August, 1942, he skilfully located a dinghy adrift in the Mediterranean, and the crew were later rescued. In March, 1943, he was the navigator of one of a section of Beaufighters patrolling over the Bay of Biscay. During the operation his aircraft sustained severe damage in an encounter with a Ju 88, which was shot down. The situation appeared hopeless, but, as the intercommunication system was unserviceable, Flt. Sgt. Corder crawled through to the cockpit, where he gave his pilot a course for base. Returning to his seat he attempted to signal their plight to other aircraft of the formation, but his efforts were unavailing. In the meantime, the pilot was having considerable difficulty in controlling the aircraft, so Flt. Sgt. Corder once more crawled to the cockpit to assist. The port engine failed, and the possibility of flying to this country seemed remote. Nevertheless, Flt. Sgt. Corder calmly continued his duties, repairing the intercommunication, obtaining bearings, and doing everything within his power to assist his pilot. The aircraft, which was extremely difficult to control, was now being flown almost at sea level. When nearing the English coast the second engine

DESERT BOMB STORE: Missiles of all shapes, sizes and character laid out on the sand to await delivery to bomber stations.

caught fire, while some oil in the cockpit also caught alight. Just as the pilot had decided that the damaged aircraft should be abandoned the English coast was sighted, so he struggled on. Meanwhile, Flt. Sgt. Corder coolly sent out distress signals, and fired Very cartridges intermittently to attract the attention of people on shore. He guided the pilot to the lowest part of a cliff, which was crossed safely, and a crash-landing effected on an airfield. On impact the aircraft burst into flames, but both Flt. Sgt. Corder and his pilot were able to jump clear.

Distinguished Flying Medal

Sgt. J. W. T. M. SMITH, No. 408 (R.C.A.F.) Sqn.—For citation see Sqn. Ldr. Gilmore.

Flt. Sgt. R. E. TAYLOR, R.C.A.F., No. 420 (R.C.A.F.) Sqn.—One night in February, 1943, this airman was the pilot of an aircraft detailed to attack Wilhelmshaven. Although the constant speed units of one of the propellers became unserviceable early on the outward journey, Flt. Sgt. Taylor flew on to the target and bombed it. Shortly afterwards, trouble developed in the port engine, while the aircraft was hit by anti-aircraft fire and went out of control. Flt. Sgt. Taylor quickly regained control and, a few minutes later when the bomber was attacked by an enemy fighter, he skilfully evaded its fire and enabled his own rear gunner to deliver a damaging burst. Sometime later, the port engine ceased to function but Flt. Sgt. Taylor succeeded in flying the damaged aircraft back to this country.

Sgt. W. BRAZILL, No. 150 Sqn.—One night in September, 1942, Sgt. Brazill was the navigator of an aircraft engaged on an operational mission. In hazardous circumstances, his courage, fortitude and devotion to duty were of the highest order.

Flt. Sgt. R. D. ROBERTS, No. 158 Sqn.—One night in March, 1943, this airman captained an aircraft detailed to attack Nuremburg. Whilst some distance from the target, on the outward flight, one of the port-engines failed. Despite this, Flt. Sgt. Roberts continued his mission. Considerable height had been lost by the time the target was reached but, in the face of heavy anti-aircraft fire, this captain pressed home a vigorous attack. After the bombs were released the bomb doors jammed. The aircraft began to lose height but, some 15 minutes later, Flt. Sgt. Roberts succeeded in getting the doors closed. Displaying superb airmanship, he eventually flew the aircraft safely to base with three engines.

Flt. Sgt. J. A. J. BARSALOU, R.C.A.F., No. 10 Sqn.—One night in March, 1943, this airman was the rear gunner of an aircraft which attacked Essen. When nearing the target area the bomber was subjected to heavy anti-aircraft fire, and its fuselage was pierced in 18 places. The rear turret was riddled and Flt. Sgt Barsalou was severely wounded, but refrained from informing his captain, who went on to bomb the objective. A few minutes later, when his captain once more enquired if he was all right, Flt. Sgt. Barsalou gave a reassuring reply and warned him of the presence of an enemy fighter. It was shaken off and a member of the crew was ordered to investigate the rear turret. Flt. Sgt. Barsalou was then found slumped over his guns and the turret a mass of blood. He had received severe shrapnel wounds. Although in great pain, very weak and bleeding profusely, he attempted to minimise his injuries and insisted that he could bear up until the English coast was reached. When the aircraft was finally landed Flt. Sgt. Barsalou was rushed to hospital.

Sgt. D. C. USHER, No. 145 Sqn.—Sgt. Usher has completed 70 sorties. One day in January, 1943, he took part in an engagement against nine Macchi 200's, covered by six Me 109's. In the combat, Sgt. Usher engaged the Messerschmitts, breaking up their attacks and shooting one of them down. Thus, the rest of his formation were enabled to press home their attacks on the Macchi's, four of which were destroyed. Sgt. Usher has taken part in many low level attacks on ground targets, gunning them with telling effect; he has also destroyed a Ju 87 in combat.

Flt. Sgt. M. MARMENT, R.N.Z.A.F., No. 408 (R.C.A.F.) Sqn.—This airman, who has completed twenty-five sorties, is a gallant and determined captain. One night in March, 1943, he captained an aircraft detailed to attack Stuttgart. On the return flight the bomber was engaged by an enemy fighter and sustained severe damage. Two engines were put out of action, but, displaying superb airmanship, Flt. Sgt. Marment flew the bomber to an airfield in this country.

Flt. Sgt. A. L. ROSS, R.C.A.F., No. 408 (R.C.A.F.) Sqn.—Flt. Sgt. Ross has taken part in thirty sorties against a wide range of enemy targets. He is a fine operational captain who invariably presses home his attacks with great determination.

Sgt. K. R. BURTON, No. 214 Sqn.—One night in March, 1943, this airman was the pilot of an aircraft detailed to attack Stuttgart. On the outward flight one engine in the bomber failed. The target was still 150 miles distant, but Sgt. Burton continued his flight and eventually bombed his target from a low level. On the return flight Sgt. Burton was unable to maintain height above 3,000 feet, and there was the possibility of the petrol becoming exhausted, but he finally succeeded in flying the aircraft back to base.

Sgt. H. E. PARRAT, No. 408 (R.C.A.F.) Sqn.—This airman has flown on thirty operational missions as wireless operator. On one occasion in February, 1943, the aircraft in which he was flying was badly damaged by anti-aircraft fire. Sgt. Parrat skilfully obtained radio fixes which enabled his pilot to set a course for base.

Sgt. J. M. J. SMITH, No. 218 Sqn.—In March, 1943, this airman was the wireless operator of an aircraft which attacked Nuremburg. On the return flight, whilst still over enemy territory, the compass became unserviceable, and when Sgt. Smith obtained a fix by means of his wireless apparatus, it was apparent that the aircraft was well off its course. Petrol was running low, but more good work by Sgt. Smith, who speedily obtained homing fixes, enabled the pilot to set the correct course and, eventually, to reach an airfield near the coast, where a landing was effected almost as the petrol became exhausted.

Flt. Sgt. W. F. BUNTING, No. 150 Sqn.—Flt. Sgt. Bunting has completed 40 operational sorties At all times he has displayed the utmost devotion to duty, and by his efficiency as bomb aimer and gunner has fully contributed to the successful results attained by his crew.

Flt. Sgt. C. E. DELANY, R.C.A.F., No. 142 Sqn.—This airman has completed 31 operational sorties as a rear gunner, and by his steady and skilful method of guiding his pilot through heavy ground defences has contributed in no small measure to the successes achieved. One night in May, 1942, Flt. Sgt. Delany was a member of a crew detailed to attack Stuttgart. Whilst over the target area the bomber was attacked by an enemy night fighter. Flt. Sgt. Delany drove off the first attack, and directed his pilot in the subsequent evasive tactics, which resulted in the engagement being broken off, and enabled the mission to be successfully completed.

Flt. Sgt. A. DRABBLE, No. 150 Sqn.—This airman has completed many operational missions. Invariably he has displayed the utmost keenness, while his technical skill as wireless operator has materially contributed to the many successes achieved by his crew.

Sgt. L. W. MATHEWS, R.C.A.F., No. 150 Sqn.—This airman has completed 31 operational sorties

FRONT VIEW: Attending to the Packard-built Merlin XXVIII in a Curtiss P.40 Warhawk.

over Germany, Italy and Tunisia. He has invariably pressed home his attacks with courage and determination, and has obtained many excellent photographs. On one occasion when taking part in an operation over Sicily, his aircraft sustained damage, and his rear gunner received wounds which proved fatal. Sgt. Mathews brought his damaged aircraft safely back, landing with his wounded comrade at an airfield where hospital attention was available.

Flt. Sgt. A. E. HORNE, R.A.A.F., No. 405 (R.C.A.F.) Sqn.—In all the operations in which he has participated, Flt. Sgt. Horne has displayed untiring devotion to duty. On one occasion he was flying in an aircraft which was shadowing an enemy convoy when it was attacked by two Ju 88s. During the ensuing action this airman calmly put up a stout defence, and by the expert use of his guns made a valuable contribution to the success of the encounter. One of the enemy aircraft was destroyed and the other damaged and probably destroyed.

THE KING has been graciously pleased to approve the following awards:—

George Medal

F/O. H. D. LINK, R.C.A.F.—In January, 1943, F/O. Link was the rear gunner of an aircraft which crashed a few miles away from an airfield and caught fire. Although thrown clear of the wreckage, this officer sustained injuries to his back and was badly cut about the head and face. Disregarding his injuries and the danger from exploding ammunition, petrol tanks and oxygen bottles, F/O. Link immediately proceeded to assist other members of the crew who were trapped in the blazing wreckage. By his heroic efforts he succeeded in releasing two of his companions, and it was not until the flames became too fierce that he abandoned his rescue efforts.

Sgt. A. L. EASTWICK.—In November, 1942, Sgt. Eastwick was the wireless operator of an aircraft which crashed and burst into flames. He managed to get clear of the burning bomber but, finding that the bomb aimer was injured and trapped, Sgt. Eastwick re-entered the blazing aircraft. By this time the flares and petrol tanks were exploding. Despite this and the danger from the ammunition, which was liable to explode at any moment, Sgt. Eastwick successfully extricated the bomb aimer and then assisted in the rescue of the rear gunner, who was also injured.

Cpl. G. REES, No. 89 Sqn.—In June, 1942, an aircraft crashed and the petrol caught fire. Cpl. Rees, on being informed that the rear gunner was still in the aircraft, immediately went to the rescue, although fully aware that it was loaded with bombs. He searched the interior of the aircraft, although, in fact, the rear gunner had been thrown clear and killed. On another occasion in November, 1942, when a fire occurred in the wing of an aircraft and caused an explosion, Cpl. Rees obtained a fire extinguisher, jumped on the wing, and succeeded in putting out the flames, which were around the petrol tanks. His gallant action saved a valuable aircraft. Finally, in December, 1942, whilst he was engaged with a party in refuelling an aircraft an attack was made by enemy fighter bombers. In the midst of a hail of cannon and machine-gun fire Cpl. Rees started the engine and drove the bowser away from the aircraft he was refuelling.

A/C.2 V. S. MARSH.—One morning in December, 1942, A/C. Marsh was engaged on a routine inspection of a marine craft refueller, when an explosion occurred in the engine room. One of his companions was severely burned and blinded. Disregarding the flames, A/C Marsh made his way into the engine room and, after several attempts, he succeeded in dragging the airman to safety. He then returned to the engine room and closed all portholes and hatches, thus localising the fire. The courage and devotion to duty displayed by A/C. Marsh undoubtedly saved his companion's life and prevented the refueller from becoming a total loss.

B.E.M. (Mil.)

L.A/C. K. G. COLES, R.A.F.—One night in December, 1942, L.A/C. Coles was undergoing training as a navigator in an aircraft detailed for a navigation exercise. The aircraft crashed into the top of a hill and all members of the crew were seriously injured. L.A/C. Coles, although suffering intense pain and being very weak, having sustained a compound fracture of the left arm with multiple abrasions and severe shock, dragged one of his helpless comrades out of the aircraft and clear of the wreckage. He then assisted the remaining two airmen to safety. During the whole of this time there was a grave danger of fire due to escaping petrol.

Roll of Honour

Casualty Communiqué No. 230

THE Air Ministry regrets to announce the following casualties on various dates. The next of kin have been informed. Casualties "in action" are due to flying operations against the enemy; "on active service" includes ground casualties due to enemy action, non-operational flying casualties, fatal accidents and natural deaths.

Of the names in this list 78 are second entries giving later information of casualties published in earlier lists.

Royal Air Force

KILLED IN ACTION.—F/O. S. B. De Mier; Cpl. F. J. G. Miller.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Sgt. L. T. Baker; P/O. J. F. Beckett, D.F.M.; Sgt. F. Coulson; Flt. Lt. W. J. Ewart; P/O. G. Gascoyne, D.F.M.; Sgt. J. H. Hackett; Sgt. A. J. Harrison; Sgt. B. T. Haylock; Flt. Sgt. J. T. Healey; Sgt. W. Jackson; Flt. Sgt. G. E. Lawrence; P/O. C. Lewis; P/O. R. A. Minchin; Sgt. B. D. Moss; Sgt. H. J. Ody; Flt. Lt. H. G. Pilling; P/O. J. F. V. Saunders; P/O. R. Scrivan; Flt. Sgt. D. R. Stuart; Sgt. J. R. Thompson; Sgt. R. L. Trustram.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. H. C. Andrews; P/O. C. H. Beet; Sgt. A. F. Blencowe; P/O. R. A. Bowker; Sgt. H. B. Bullen; Sgt. H. Chilvers; Sgt. W. B. Eastwood; Sgt. F. O'K. Eivers; Sgt. A. A. Ferguson; Sgt. J. V. Gardner; P/O. D. W. Garland; Sgt. J. B. Gower; Sgt. W. Gray; Sgt. S. H. Harle; Sgt. W. Helliwell; Act. Wing Cdr. P. W. Lynch-Blosse, D.F.C.; Act. Flt. Lt. C. S. C. McClure D.F.C.; F/O. D. G. MacKay; P/O. J. M. Marchington; Flt. Lt. D. E. Milcham; Sgt. J. Moore; Sgt. A. J. Moth; Sgt. D. W. Musgrove; Sgt. K. S. Preston; Flt. Sgt. J. Rogers; P/O. H. P. Rose; Sgt. D. M. Sharp; P/O. J. M. W. Somerville; Sgt. W. R. West; Sgt. V. P. W. Wheaton.

MISSING, BELIEVED KILLED IN ACTION.—Sgt. G. W. Armer; Sgt. C. Avery; Sgt. W. D. Bowmen; Sgt. D. B. Care; Sgt. D. A. Crofts; P/O. K. H. Ellis; Act. Sqn. Ldr. J. L. Fletcher, D.F.M.; Sgt. J. Howe; Flt. Sgt. H. S. Howland; Sgt. A. L. Hyrons; Sgt. D. Kelly; Sgt. J. G. Lamb; Sgt. W. A. Martin; Flt. Sgt. J. Mead; F/O. H. L. Meller; Sgt. G. A. Moss; Sgt. R. A. Nunn; Sgt. J. C. Paton; Sgt. D. W. Perch; Sgt. W. H.

...ATION

Pritchard; Act. Flt. Lt. R. E. Richman, D.F.M.; Flt. Sgt. J. D. W. Stenhouse; Sgt. L. A. Trinder; Flt. Sgt. S. L. C. Watts; Flt. Lt. A. T. Wheatley; Sgt. J. H. B. Wright.

MISSING.—Sgt. A. S. Adger; Sgt. K. A. Amond; P/O. H. W. Astin;; Flt. Sgt. W. F. Austin, D.F.M.; Sgt. P. Bailey; Sgt. W. H. Barrow; Sgt. K. F. Bartholomew; Sgt. A. Battram; Sgt. A. Beauchamp; Sgt. C. E. Bellamy; P/O. G. A. Bissett; Sgt. D. E. J. Boland; Sgt. R. Brown; F/O. A. N. Bulpitt; Sgt. T. J. Caveney; Sgt. K. H. Chapman; Sgt. C. F. Clout; Sgt. E. J. Cook; Sgt. D. G. J. Coombes; Sgt. R. E. Dignum; F/O. J. B. Duncan; Sgt. C. V. Ellen; Act. Sqn. Ldr. P. C. Elliott, D.F.C.; Sgt. P. J. Elton; Sgt. W. H. V. Evans; Sgt L. Farmer; Sgt. B. F. Forman; Sgt. H. McA. Frew; Sgt. W. J. E. Glenn; Sgt. F. Gotheridge; Sgt. G. E. Green; Sgt. A. Greig; Sgt. R. H. Hale; Sgt. J. Harvey; Sgt. L. J. Hollerton; Sgt. L. A. Horne; Sgt. S. G. Hunt; Sgt. A. Innes; Sgt. R. Isaacs; Sgt. J. H. Jones; Sgt. K. V. Jones; Sgt. R. V. Ledger; Sgt. J. Little (1126807); Sgt. J. Little (984813); Sgt. W. G. Ludbrook; Sgt. J. McGrane; Flt. Sgt. E. T. H. McLean; Flt. Sgt. T. A. Marsden; P/O. W. I. Moffat; Sgt. J. W. Newton; Sgt. R. W. Paull; Sgt. K. G. Peters; Sgt. R. W. Radford; Flt. Sgt. T. N. Sankey; Sgt. W. O. Shelley; Sgt. H. Sherratt; Sgt. A. J. Sinclair; F/O. E. L. Souter-Smith; Sgt. J. Stoneley; Flt. Sgt. A. F. E. Tilley; Sgt. W. E. Toft; Sgt. N. F. Trigg; P/O. R. W. Turner; Sgt. R. Unwin; Sgt. D. N. D. Waite; Sgt. H. Walker; Sgt. R. G. Watson; Sgt. J. W. Webster; Flt. Sgt. R. A. B. Willmott; Sgt. B. H. Yarwood.

KILLED ON ACTIVE SERVICE.—Sgt. P. F. Bacon; P/O. D. W. Bryant; F/O. T. D. Gordon; Sgt. D. Herbert; P/O. C. R. Jackson; Sgt. R. W. Kerr; Sgt. T. P. G. Milledy; Sgt. R. Oldfield; Sgt. G. W. Patey; P/O. D. A. Phillips; Sgt. G. A. A. Ranken; L.A/C. W. Robinson; F/O. N. Smart; A/C.1 S. E. Williams.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED ON ACTIVE SERVICE, NOW REPORTED KILLED ON ACTIVE SERVICE.—Sgt. H. J. B. Harrison.

WOUNDED OR INJURED ON ACTIVE SERVICE.—L.A/C. J. G. Lowe.

DIED ON ACTIVE SERVICE.—L.A/C. M. S. Beecham; A/C.2 L. A. Cloke; Cpl. W. Graham; A/C.1 J. L. Griffiths; L.A/C. T. G. Mogridge; L.A/C. W. E. Smith; A/C.1 A. Stewart; A/C.2 J. A. Styles; L.A/C. W. M. Unsworth.

Royal Australian Air Force

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Sgt. R. A. Broodbank; Sgt. J. Donn-Patterson; Sgt. C. H. Muir; Sgt. R. H. Murphy; Sgt. J. R. Shearer.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. G. F. Bolton.

MISSING, BELIEVED KILLED IN ACTION.—Flt. Sgt. G. S. Sloman.

MISSING.—Flt. Sgt. R. C. Davie; F/O. F. B. Hawkins; Sgt. F. J. Silk.

KILLED ON ACTIVE SERVICE.—Sgt. E. C. Fulton; Sgt. R. C. Graham; Sgt. E. F. Murphy; Sgt. R. C. M. Webster.

Royal Canadian Air Force

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—W/O. H. A. Morris.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. A. F. Conway; P/O. M. Edwards; Sgt. A. R. Henman; Flt. Sgt. J. C. King; Sgt. M. McAroy; Sgt. J. A. McWilliams; P/O. D. H. Sargent; Flt. Sgt. C. M. Shannon; Flt. Sgt. H. E. Went; Sgt. W. R. West.

MISSING, BELIEVED KILLED IN ACTION.—Flt. Sgt. F. C. Duncan; Sgt. E. G. Lacina; Sgt. R. G. MacDonald; Flt. Sgt. H. B. Moore; P/O. G. G. Stanley.

MISSING.—Flt. Sgt. W. R. Affleck; Sgt. A. J. Bagg; P/O. G. R. Baker; Sgt. L. J. Baribeau; W/O. L. W. Brayford; Sgt. B. F. Brown; Flt. Sgt. E. L. Bulman; Sgt. T. E. J. Casey; Flt. Sgt. W. Colangelo; Flt. Sgt. D. B. Coons; Flt. Sgt. D. M. Cox; P/O. C. G. Cumming; Sgt. C. F. Daley; P/O. B. C. Dennison; Flt. Sgt. A. McK. Dickie; Sgt. A. J. Down; Sgt. D. A. Ferguson; Sgt. W. D. Hartney; P/O. H. J. Jennings; Sgt. J. A. Kilpatrick; Act. Sqn. Ldr. L. E. Logan; Flt. Sgt. D. W. Lowther; P/O. L. J. McDougall; Flt. Sgt. D. P. McLachlan; Sgt. E. K. Matlock; Sgt. L. Murphy; P/O. A. F. Reif; P/O. J. G. Ripley; P/O. G. L. Spencer; Flt. Sgt. R. Strong; P/O. F. M. Tomlinson; Sgt. J. A. M. Tremblay; F/O. L. McB. Wadman; Flt. Sgt. J. L. Ward; Flt. Sgt. R. H. Ward; F/O. R. E. Wesley; Flt. Sgt. M. E. White, D.F.M.; Sgt. G. A. Young; Sgt. M. Zeavin.

KILLED ON ACTIVE SERVICE.—Sgt. A. P. M. Aitken; P/O. R. L. Benson; Sgt. J. W. Billing; Sgt. G. E. Clarke; Sgt. R. S. Greengrass; Sct. A. W. Leckie; Sgt. J. H. McCormick; Sgt. J. H. McGinn; P/O. W. G. McLaughlin; Sgt. B. J. O'Donnell; P/O. A. B. Shives; Sgt. L. Taylor.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—Sqn. Ldr. L. J. Birchall.

Royal New Zealand Air Force

KILLED IN ACTION.—Sgt. C. C. Aitken.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. M. Y. Kennedy.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. V. P. Cummock; Sgt. J. M. Hall; Sgt. E. C. Inder; Sgt. R. R. A. Jones; Sgt. W. G. Mutton; Sgt. A. N. Young.

WOUNDED OR INJURED IN ACTION.—F/O. G. R. Gould.

MISSING.—Flt. Sgt. O. E. Amos; Sgt. N. E. Cundy; F/O. B. F. R. Hotson; Flt. Sgt. P. G. Roberts.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Sgt. K. L. McAdam.

WOUNDED OR INJURED ON ACTIVE SERVICE.—Sgt. N. J. Trewavas.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—Sgt. W. H. MacMaster.

South African Air Force

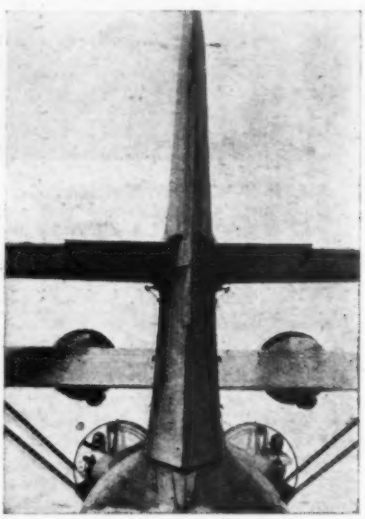
MISSING.—Lt. J. T. Platt; 2/Lt. C. Southwood.

KILLED ON ACTIVE SERVICE.—Capt. A. C. F. Selis; Maj. F. W. Spencer.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—Flt. Sgt. C. N. Barrett.

Indian Air Force

DIED ON ACTIVE SERVICE.—A/C.2 P. Swaminathan.



BACK VIEW: How the .5in. machine guns in the blisters protect the tail of a U.S. Consolidated PBY-5A Catalina.

Casualty Communiqué No. 231.

Of he names in this list, 113 are second entries giving later information of casualties published in earlier lists.

Royal Air Force

KILLED IN ACTION.—Sgt. F. H. Elder; Sgt H. E. Evans; F/O. M. E. Hallam; Sgt. O. S. Milburn; Sgt. G. R. Saville; Sgt. A. Schofield; F/O. G. L'E. T. Skipwith; P/O. G. H. Turner; Sgt. W. L. Waller.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Sgt. W. Y. Alderdice; Sgt. G. W. Brown; Sgt. R. Catley; Sgt. R. E. Gay; Sgt. C. F. Goode; Sgt. J. Hewitson; Sgt. J. R. Jones; Act. Flt. Lt. G. R. Lane; P/O. H. Norfolk; Flt. Sgt. E. Seway; P/O. J. J. Walker; Sgt. S. H. Woolley.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. G. Alder; Sgt. M. S. Ash; P/O. B. F. Ball; P/O. G. C. Bayley, D.F.C.; P/O. W. S. Blackadder; Flt. Sgt. D. Block; Sgt. A. L. Brooks; Flt. Sgt. R. H. W. A. Camm; Flt. Sgt. R. F. Carroll; Sgt. S. C. Carter; Sgt. G. H. Chamberlin; Sgt. R. A. Chapman; Sgt. W. H. Charlesworth; Sgt. R. C. Cockayne; Sgt. H. L. Cox; Sgt. K. R. Curran; Flt. Sgt. H. L. Davies; Act. Sqn. Ldr. P. M. De Mestre, D.S.O., D.F.C.; Sgt. E. R. Douglass; P/O. D. Ellis; Sgt. T. J. Francis; P/O. B. G. Galloway-Wilson; Flt. Sgt. E. C. Glenwright, D.F.M.; Sgt. E. B. Goodwin; Sgt. L. T. Grimshaw; Sgt. G. C. Haynes; Sgt. T. Henderson; Sgt. D. V. Howes; Sgt. J. F. Howes; Sgt. T. H. Inch; Sgt. J. M. C. Jenkinson; P/O. J. L. Jones; Sgt. J. R. Jones; Sgt. L. J. Jones; Act. F/O. A. Kinniburgh; Sgt. G. Lakeman; Flt. Sgt. J. E. Lineham; Sgt. R. McCrae; Sgt. A. G. J. McMechan; Sgt. N. J. Naylor; P/O. W. Nisbet; Sgt. C. O'Neill; Sgt. A. G. Parrott; Sgt. M. A. Pickering; Sgt. R. C. Prior; Sgt. J. C. Ramsey; Sgt. R. P. Reilly; Sgt. R. G. Richards; Sgt. H. Rowsell; Sgt. C. G. Sherratt; P/O. G. G. Shore; Sgt. E. G. Smith; Sgt. R. Q. Stevens; Sgt. J. Swales; P/O. P. H. J. Thorndyke; Act. Flt. Lt. F. M. Thorne; Sgt. S. H. Wise; Sgt. L. J. Yeates.

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED IN ACTION.—Sgt. H. Allen; P/O. J. H. Harrad; Sgt. R. H. Linton.

WOUNDED OR INJURED IN ACTION.—F/O. I. Adamson.

DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—Flt. Sgt. J. C. Colley.

MISSING, BELIEVED KILLED IN ACTION.—Sgt. L. A. Ketley; Sgt. R. E. Stockburn.

MISSING.—Sgt. R. S. Allen; F/O. A. D. A. Barnes; P/O. F. W. Bartleet; P/O. E. H. Beeton; Sgt. A. L. Bellerby; Flt. Sgt. W. Billington, D.F.M.; Flt. Sgt. W. C. Burr; Sgt. E. W. Carter; Sgt. K. W. Chipchase; Sgt. R. Clark; P/O. G. Cook; Sgt. G. W. Dillon; P/O. W. H. Donald; Sgt. W. Eliot; Sgt. V. N. Elkins; Sgt. H. M. Felce; Sgt. G. C. Felstenstein; Flt. Lt. A. R. Foggo; Sgt. E. J. Gray; Sgt. R. Henderson; Sgt. D. T. Hodgson; Sgt. J. Hughes; Flt. Sgt. L. E. J. Humber; Cpl. F. S. Humble; Cpl. W. J. Hunter; P/O. H. V. Ingulden; Sgt. B. Jackson; Cpl. G. Jones; Cpl. J. W. Kent; Sgt. C. H. Lewis; P/O. D. G. Lovell; Sgt. J. S. Lowdell; Flt. Sgt. A. Lynch; Sgt. J. MacFarlane; F/O. A. F. MacQueen; Act. Sqn. Ldr. D. A. J. McClure; Flt. Lt. N. A. J. Mackie, D.F.C.; P/O. A. A. Marcus; Cpl. A. Moore; Sgt. R. Moore; Sgt. G. E. Morris; Flt. Sgt. P. J. Musk; Act. Flt. Lt. A. M. Ogilvie; Sgt. R. McM. Pace; P/O. C. W. V. Pepper; P/O. H. D. Powell; Sgt. W. P. Quinleven; Sgt. J. W. Rider; Sgt. T. Robinson; P/O. V. P. Rogers; P/O. R. W. Sills; P/O. K. A. Simpson; Sgt. K. C. Simpson; Sgt. A. Skinner; Wing Cdr. J. H. Slater, A.F.C.; Sgt. N. S. Stedman; Cpl. A. S. Stevens; Cpl. C. A. Swann; Sgt. A. W. E. Taylor; Sgt. D. Thomas; Sgt. A. L. Thurlow; P/O. K. S. Toms; P/O. S. R. Tuck; Sgt. J. N. Unsworth; Sgt. E. E. Vine; P/O. D. J. Virgo; P/O. C. A. T. Walshaw; P/O. L. E. Warren; Sgt. T. L. Williams; Sgt. K. E. Winsor.

KILLED ON ACTIVE SERVICE.—Sgt. C. S. Allen; Sgt. A. F. Ash; A/C.2 S. L. Brain; Sgt. P. Brook; P/O. K. J. Brown; Sgt. A. R. Burgess; Sgt. F. R. Conway; Flt. Sgt. L. J. Coppins; A/C.2 J. W. Doyle; A/C.1 P. J. Hall; Sgt. F. W. Hawkins; Sgt. L. F. Hills; Sgt. H. T. Holley; P/O. E. M. Hollowell; Sgt. R. G. Jewell; F/O. J. Johnston; P/O. J. McCubbin; Flt. Lt. R. A. Miles, D.F.C.; Sgt. J. E. Rouse; P/O. S. W. Shepherd; Sgt. D. Smith; Flt. Lt. E. D. Spratt; A/C.2 A. Surgenor; Sgt. D. Williams; Sgt. J. A. Willis; Flt. Sgt. J. Wreakes; F/O. J. H. Wright.

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED ON ACTIVE SERVICE.—Sgt. R. A. Ashmore; P/O. J. Lorkin.

WOUNDED OR INJURED ON ACTIVE SERVICE.—Flt. Sgt. A. H. G. Biggs; Sgt. W. G. Brearley; A/C.2 F. Butcher; L.A/C. N. G. L. Gaze; Sgt. M. W. Hanley; Sgt. F. A. John; Sgt. R. F. Lee; P/O. C. D. Phippen; Cpl. J. Whitehead.

DIED ON ACTIVE SERVICE.—A/C.1 J. P. Beesley; Flt. Sgt. A. L. Churchill; A/C.1 M. E. Fowler; A/C.1 R. Fulford; Cpl. G. A. Green; Flt. Lt. H. A. Matthews; Flt. Lt. W. A. Nicholls; Cpl. W. R. Pales; A/C.2 S. Richardson; A/C.2 F. S. Stallan.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—A/C.1 H. T. Ward; Sgt. D. H. Webster.

Women's Auxiliary Air Force

KILLED ON ACTIVE SERVICE.—A/CW.1 E. Wood.

DIED ON ACTIVE SERVICE.—A/CW.1 H. M. M. Turner.

Royal Australian Air Force

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—P/O. L. G. Chick; Sgt. A. J. Glaister; Sgt. M. B. Remfry.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. J. R. Buckingham; Sgt. W. S. McQueen; Sgt. F. R. Martin; Sgt. R. G. M. Roget.

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED IN ACTION.—Sgt. V. J. Watson.

MISSING.—Sgt. P. J. Fitzgerald; Sgt. J. H. W. McDonagh; F/O. P. MacDonald; Sgt. H. S. Stockbridge; Sgt. S. R. Wright.

KILLED ON ACTIVE SERVICE.—Sgt. W. D. K. Forbes; Flt. Sgt. L. D. Watson.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—Flt. Sgt. E. A. Martin.

Royal Canadian Air Force

KILLED IN ACTION.—Flt. Sgt. P. D. Dempsey; Flt. Sgt. B. M. Haight; F/O. B. L. McMahon; P/O. R. C. O'Brien; Flt. Sgt. W. C. Wicker.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. J. R. Cooper; Flt. Sgt. L. D. Jackson; Flt. Sgt. S. L. Reid; Flt. Sgt. A. D. Robert; Flt. Sgt. J. A. Thompson.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. S. L. G. Buchanan; Group Capt. H. R. Carefoot; P/O. S. G. Goatley; Sgt. L. G. Harvie; Sgt. E. F. Hueston; Sgt. D. H. Kurtz; Flt. Sgt. R. D. K. MacPherson; Sgt. A. McK. Mowbray; Sgt. R. A. J. Ribout; Sgt. E. G. Robertson.

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED IN ACTION.—P/O. J. E. Madson; P/O. T. L. Wilson.

WOUNDED OR INJURED IN ACTION.—Flt. Sgt. J. Barsalou.

MISSING, BELIEVED KILLED IN ACTION.—F/O G. J. Cory; Flt. Sgt. W. F. Topping.

MISSING.—P/O R. G. Caldwell; Act. Flt. Lt. C. S. Campbell, D.F.C.; Sgt. W. B. Drake; Sgt. R.

SERVICE AVIATION

Dunbar; Flt. Sgt. T. A Dutton; Sgt. J. H. M. Kerr; Sgt. A. P. Larson; Sgt. L. McL. Lymburner; Sgt. H. S. McPherson; Sgt. H. R. Milson; Flt. Sgt. L. A. Parker; Sgt. D. C. Plaunt; Sgt. J. N. Reigate; Sgt. J. A. E. St. Laurent; P/O. A. J. Smith; Sgt. J. A. J. L. Viau; Act. Flt. Lt. O. R. Waterbury, D.F.C.

KILLED ON ACTIVE SERVICE.—P/O. S. Spector; P/O. P. E. T. Townsend.

Royal New Zealand Air Force

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. D. F. Clifford; P/O. B. M. Cook; P/O. E. T. P. Dalzell; Sgt. D. P. Hogan; Sgt. N. R. Kilpatrick; Sgt. R. Riddell; Sgt. K. S. Spencer; Sgt. V. A. Tunbridge; Sgt. C. E. Wells.

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED IN ACTION.—Sgt. T. L. Boland.

MISSING.—Sgt. A. V. G. Cridge; Sgt. F. Mangleson; Sgt. R. S. Whitcombe.

KILLED ON ACTIVE SERVICE.—Sgt. G. H. McIlraith; Sgt. G. St. G. Putt; Sgt. F. A. Weaver.

South African Air Force

WOUNDED OR INJURED ON ACTIVE SERVICE.—Act. Cpl. F. G. Thompson.

Casualty Communiqué No. 232.

Of the names in this list, 80 are second entries, giving later information of casualties published in earlier lists.

Royal Air Force

KILLED IN ACTION.—F/O. R. Benzies; P/O. P. Britten; Sgt. J. Rogerson; Sgt. H. Tattersall; P/O. N. F. Westwood.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Sgt. F. Ashworth; Sgt. M. J. M. Davies; Sgt. L. J. Howe; F/O. D. A. Kingston; Sgt. R. A. Low; Sgt. B. F. Wischhusen.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. J. A. Bloomfield; Act. Wing Cdr. S. McC. Boal, D.F.C.; Sgt. W. J. Brazier; Sgt. L. Causley; Sgt. J. S. Clarke; Sgt. H. Condron; Wing Cdr. H. D. Cooke; Sgt. A. B. Croft; Act. Sqn. Ldr. C. N. Crook; Sgt. R. S. Cruise; Sgt. J. Daley; P/O. W. Davies; Sgt. H. Downs; Flt. Sgt. P. F. P. Enna; Sgt. E. Forman; Sgt. W. A. Freeman; Sgt. C. N. Gardner; Sgt. L. A. L. Gray; Sgt. R. V. Hagborg; Sgt. D. S. Hall; Flt. Lt. L. O Halls, D.F.C.; P/O. D. Hellyer; Flt. Sgt. R. A. W. Hubbard; Sgt. B. Hunter; Sgt. C. S. Jefferies; Sgt. D. G. Jillings; Sgt. H. Jones; Flt. Sgt. G. Kelly, D.F.M.; Flt. Sgt. R. Kinsey; Sgt. G. W. J. Lovell; P/O. G. W. Macallister; Sgt. P. McCann; P/O. M. MacI. Macfarlane; Act. Sqn. Ldr. T. C. McGillivray; Flt. Sgt. G. McGlynn; Sgt. J. MacI. Macmahon; P/O. J. P. Muirhead; Flt. Lt. D. G. Redman; Sgt. J. R. Rennie; Sgt. P. Rix; Sgt. W. P. Rixon; P/O. H. J. Skelly; Sgt. J. J. Smith; Sgt. R. J. Smith; Sgt. G. R. S. Spencer; Sgt. C. C. Stevens; Sgt. H. F. Stroud; Flt. Sgt. N. Tetley; Sgt. T. H. F. Wood.

WOUNDED OR INJURED IN ACTION.—Sgt. R. H. Ames; Sgt. G. W. Bradley; Sgt. A. J. M. Dooley; F/O. D. H. Eden; Flt. Sgt. G. F. Keen; F/O. S. F. Laraman; Sgt H. C. Payne; Sgt. T. H. Yellowlees.

MISSING, BELIEVED KILLED IN ACTION.—Sgt. L. Barker; Sgt. G. E. Benson; Sgt. H. Bentley; Sgt. D. Collins; Sgt. W. H. Cosnell; Sgt. A. R. Dawson; F/O. J. R. De La Coze; Sgt. C. G. Dyer; Sgt. J. Freel; Sgt. R. B. P. H. Heath; Sgt. G. A. Hyatt; Sgt. P. P. Jobling; Sgt. W. J. McClelland; Sgt. K. A. Mills; P/O. J. Millward; Sgt. J. P. O'Keefe; P/O. R. J. Paul; Sgt. J. H. Ross; Sgt. B. M. Singleton; Sgt. L. E. Thomas.

MISSING.—P/O. F. C. Adams; Sgt. W. E. Akrill; F/O. G. B. Alred; Sgt. W. Andrews; Sgt. L. E. Ashdown; P/O. A. H. Athill; Sgt. J. M. W. Barber; L.A/C. R. J. Barrett; Sgt. H. S. F. Bishell; Sgt. D. G. Blackmore; Sgt. W. A. Blackmore; Flt. Sgt. R. S. Carr, D.F.M.; Sgt. D. J. Clifford; F/O. B. Clitherow, D.F.C.; Sgt. L. G. Collings; Sgt. D. Cowie; Sgt. R. F. Cunningham; Flt. Sgt. G. R. J. Davis; P/O. D. A. Desmond; F/O. M. E. Doble, D.F.C.; F/O. H. W. Dugard; Sgt. B. J. Eckett; Sgt. K. C. Eyre; Sgt. L. P. Fallon; Sgt. E. C. Fermanian; P/O. R. W. Fray; P/O. E. W. Furminger; Sgt. A. Garden; Sgt. J. Gell; Sgt. R. A. Gerrard; Sgt. W. E. Greasley; Sgt. A. E. Hammarton; P/O. E. H. C. Hanson; Sgt. J. Harris; P/O. P. G. Harris; Sgt. W. Hart; Sgt. R. C. Hitchcock; Sgt. E. Holdsworth; Sgt. J. H. Howorth; Sgt. H. R. Hughes; Sgt. W. Hynd; Sgt. D. G. Jackson; Sgt. L. M. Jones; Sgt. W. R. Jones; Sgt. R. W. Kelsall; F/O. R. T. Kenyon; Sgt. H. F. King; Flt. Lt. W. J. King; Sgt. D. D. Laidlaw; Sgt. C. J. J. W. Lamb; Sgt R Lambert; P/O C M. Lawry; Sgt. T. C. Laws; Sgt. R. L. Laycock; Sgt. H. Ledgerwood; P/O. I. A. H. Linklater, D.F.M.; Sgt. B. L. Litolff; F/O. G. D. A. Lundon; Sgt. P. H. Luscombe; Sgt. P. G. Lyon; Sgt. D. McKensie; Flt. Sgt. R. Maslen; Sgt. J. I. Mitchell; W/O. C. J. Morgan; P/O. J. K. Murray; Sgt. F. A. Neame; Sgt. D. A. Nunn; Sgt. R. C. C. Owen; Sgt. R. E. Pearce; P/O. G. H. W. Pettigrew; F/O. G. D. N. Sandford; Sgt. E. Shaw; Sgt. A. D. Slade; Sgt. E. F. Smith; P/O. J. S. Smith; Sgt. S. G. Smith; Sgt. E. A. Steed; Sgt. F. B. Stewart; Sgt. T. Towle; Sgt. P. E. Trew; Act W/O. C. E. Tuck; Sgt. T. J. Walker; Sgt. E. H. Weaver; P/O. G. A. Webb; Sgt. C. F. White; Flt. Sgt. F. A. W. Willis; Sgt. A. E. Winstanley; Sgt. H. E. Witham; Sgt. K. R. J. Young.

MISSING, BELIEVED KILLED ON ACTIVE SERVICE.—Sgt. N. J. Cooke; P/O. C. G. Salisbury; Sgt. D. Worthington.

KILLED ON ACTIVE SERVICE.—Sgt. T. W. Agnew; L.A/C. A. J. Aldham; L.A/C. T. G. M. Argile; Sgt. L. E. Bastian; L.A/C. W. S Black; Flt. Sgt. J. W. Blyth; Cpl. R. G. Brown; Sgt. J. Callick; Sgt. A. McK. Cormack; Flt. Lt. J. C. Cox, D.F.C.; Sgt. T. F. Hockley; Sgt. L. Joisce; Sgt. L. A. Knight; F/O. W. A. L. Love; Sgt. J. McLean; L.A/C. J. McNaught; Sgt. J. T. M. Patterson; Sgt. J. D. Perring; L.A/C. J. N. Spencer; Sgt. L. G. Vaughan; Act. Sgt. H. Winstanley.

WOUNDED OR INJURED ON ACTIVE SERVICE.—Sgt. W. Clarke; L.A/C. W. H. Looker; A/C.2 H. E. L. Mill; A/C.2 S. J. Roe; A/C.2 J. H. Wilcox.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—L.A/C. S. E. Goodwin; Sgt. H. Henderson; P/O. J. R. Powell; L.A/C. G. E. Wilson.

DIED ON ACTIVE SERVICE.—Act. Sgt. T. Campbell; Sgt. W. R. Davies; L.A/C. G. Drabble; Cpl. H. J. Finch; Flt. Sgt. K. R. Ilsley; A/C.2 R. J. Jones; L.A/C. L. McNaney; Sgt. G. Parker; L.A/C. F. H. G. Toon; Act. Cpl. R. Urwin; A/C.2 H. E. Ward.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—Sgt. K. I. Austin; Flt. Sgt. W. Simpson.

Women's Auxiliary Air Force

DIED ON ACTIVE SERVICE.—A/CW.2 G. L. Counsell.

Royal Australian Air Force

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—P/O. J. C. Pottie.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. K. Allen; Sgt. C. C. McPherson; Sgt. J. L. Wilson.

MISSING.—Sgt. B. H. Bishop; Flt. Sgt. R. N. Lindsay; Flt. Sgt. A. L. McDonald; P/O. G. S. Nant; Flt. Sgt. G. H. Millett; Sgt. C. R. Townsend

ASSESSING THE WINNINGS: Gen. Montgomery inspecting the Sperry circular under-turret of the Fortress he is reported to have won as a wager by getting the 8th Army into Sfax by April 15th.

KILLED ON ACTIVE SERVICE.—Sgt. R. B. Thomson.

Royal Canadian Air Force

KILLED IN ACTION.—Sgt. J. H. Black; Sgt. G. I. H. Dunbar; Sgt. B. P. Grogan; P/O. R. J. Heather; P/O. G. C. Whitmore.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. G. J. Hardy.

WOUNDED OR INJURED IN ACTION.—Sgt. A. A. Mellin.

DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—Flt. Sgt. K. J. Hawkins.

MISSING, BELIEVED KILLED IN ACTION.—Sgt. J. E. Audy; Flt. Sgt. J. J. B. A. Dugal; Sgt. W. C. Forbes; P/O. J. V. L. Gauthier; Flt. Sgt. J. Glassberg; Flt. Sgt. J. W. M. E. Lanctin; Sgt. F. A. Marean; Sgt. W. L. G. Thompson.

MISSING.—P/O. N. Bernett; Sgt. C. R. Bird; Sgt. E. B. Clampitt; Sgt. R. I. Edwards; P/O. J. R. Kee; Sgt. D. C. Macdonald; Sgt. D. M. Mcleod; Flt. Sgt. H. C. Lewis; Sgt. C. McK. Moffatt; F/O. J. G. J. Prideaux; Flt. Sgt. J. G. Richardson; Sgt. C. H. Smith; Flt. Sgt. R. M. Tooze; F/O. R. W. Wilsdon.

KILLED ON ACTIVE SERVICE.—P/O. N. B. Burt; Sgt. S. W. Gunn; Sgt. A. G. Shorten.

Royal New Zealand Air Force

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Sgt. N. H. Blair.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. G. McD. Frostick.

MISSING, BELIEVED KILLED IN ACTION.—Flt. Sgt. C. J. Campbell.

MISSING.—Sgt. A. M. Bridgeman; Sgt. C. S. Burton; Sgt. R. C. Going; Flt. Sgt. G. A. Parkinson.

South African Air Force

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Lt. K. C. Morgan.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Air Sgt. G. Brand; Maj. A. Duncan, D.F.C.; Lt. R. A. Durose; Lt. N. S. Ford; Act. Cpl. H. N. Hawke; Lt. W. N. Hollenbach; Air Sgt. E. D. King; Lt. L. H. Murrow; 2/Lt. L. W. Rapp; Maj. S. D. F. Scott; Lt. E. F. Wakeling.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—2/Lt. C. H. Allen; 2/Lt. H. J. P. Lemmer; Air Sgt. S. Linstam; Air Sgt. L. Murray.

Official Correction

To Casualty Communiqué No. 229

Delete Sgt. H. KILLVINGTON from list of "MISSING" and include under "KILLED IN ACTION."